IRON & COAL TRADES REVIEW

SEPTEMBER 16
1960
Vol. 181
No. 4,809

ESTABLISHED 1866
Incorporating "STEEL and IRON" and "COAL"

Organ of the National Association of Colliery Managers and the Association of Colliery Managers in India

Published each Friday

Annual Subscriptions: *United Kingdom....52s.*
Abroad....60s. *Payable in advance*

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Published by
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Telephone: Trafalgar 6171 (Private Branch Exchange)
Telegraphic Address:, "Zacatecas, Rand London."

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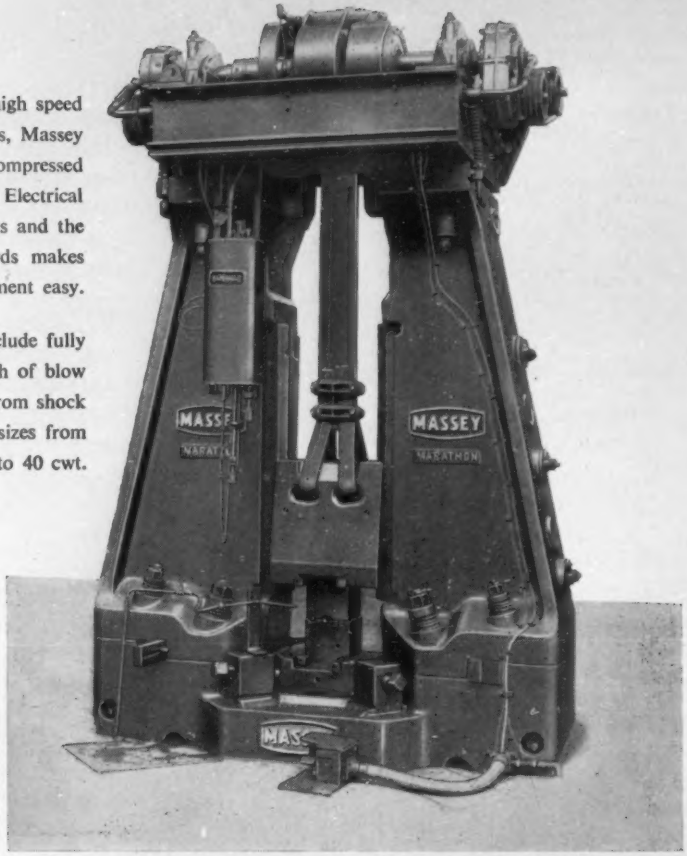

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IRON AND COAL
TRADES REVIEW

Vol. 181 September 16, 1960 No. 4,809

Oil from Coal

FOR many years mining engineers have felt that technical developments in the production of petroleum from indigenous fuels could lead to a new era for coal, in which the industry would find a far wider application for its product than is vouchsafed it today. They have not been alone in this hope. A vast amount of research has been undertaken into the production of petrol from coal and a lot of money has been spent on various projects. Technically, turning coal into oil has always been possible. The real problem is one of economics, and that, it seems, is as far away from solution as ever. The latest body to examine the situation is the Committee on Coal Derivatives, which can see no immediate prospects of setting up a commercial plant.

Faith has been placed on two main processes for the conversion of coal into petrol—high-pressure hydrogenation and the Fischer-Tropsch process. High-pressure hydrogenation involves the passing of hydrogen through a mixture of finely ground coal and oil, the reaction taking place under high pressure in the presence of a catalyst at a temperature of 450 deg. C. The greater part of the products of the resulting gas passes through a cooler to a catchpot where separation takes place between the condensed oils and the uncondensed gases. The former are collected in a tank and pumped to the distillation unit, and the heavy oils are returned to the plant for use in the initial coal/oil paste. The ICI plant at Billingham (Co. Durham), which closed in 1958 for economic reasons, applied this technique for the hydrogenation of coal and, later, of creosote. The plant was capable of producing about 320 gallons of petrol for the consumption of 5 tons of coal.

After many problems in the design and operation of the plant had been solved, two main difficulties remained. Firstly, the process called for the use of coal cleaned to an ash content of 2.5 per cent. or less. Secondly, the family motor-car of today demands a petrol of the volatility and octane rating of the same order as pre-war aviation petrols, and production of this grade of petrol would considerably reduce the yield.

The report of the Committee on Coal Derivatives evaluates the cost of the production of petrol from coal. On the basis of the operational costs of the Billingham plant it has been estimated that today the cost of the coal would be 8.7d. per gallon, the cost of the production of hydrogen, 21.6d., capital charges on the plant, at 12 per cent., 10d., and the full cost would be 46d. per gallon, allowing 6.1d. for the sale of by-products. The excise duty payable under the terms of the present Finance Act would add another 15d., giving a cost at the plant of 61d. per gallon. There would thus be a deficit of at least 10d. per gallon, before paying distribution and marketing costs, compared with the retail price of regular petrol (inner zone).

The Fischer-Tropsch process uses carbon monoxide as the raw material for making petrol. The gas is easily obtained from "water gas," a mixture of carbon monoxide and hydrogen, and is produced by the gasification of coal or coke.

The Fischer-Tropsch process takes place at atmospheric pressure and a temperature of about 200 deg. C. The only known plant employing this process is at Coalbrook, in the Orange Free State, and is operated by Suid-Afrikaanse Steenpool, Olie en Gaskorporasie Berperk (SASOL), which is sponsored and financed by the South African Government. The plant uses coal from its own mechanized mine at a cost of little more than 6s. per ton. After charging for depreciation, the plant operated at a loss of approximately £400,000 for 1959. It is believed that the profitability of the plant will depend on the revenue obtained from the sale of refined waxes and chemical products. In this respect, SASOL is in a favourable position, since, with its present scale of operations, the production of these by-products can be absorbed in South Africa, which has no other indigenous source of the same or equivalent materials. Thus, the SASOL plant enjoys a natural advantage which does not apply in the United Kingdom. In the first place, the cheapest British coals cost about seven times as much as the coal available to SASOL, and in the second place the average revenue from the sale of SASOL by-products is 35s. per ton. This unusually high figure is possible because of the high cost of competitive imports, which have to bear heavy freight charges from the coast to inland markets.

It is clear from the extensive experience obtained at the high-pressure hydrogenation plant at Billingham and from the rather limited knowledge of the application of the Fischer-Tropsch process in this country, that any future for the production of petrol from coal in this country is still many years away from the present time. For the next decade, at least, sales outlets for coal will be as a heating and power-raising fuel, and its success in this traditional field will be determined by the industry's ability to place its product on a competitive basis in relation to rival fuels.

Passing Thoughts . . .

SINCE most directors, being only men with the same capacity for feeling guilty as other men possess, do not much like objective inquiries into their behaviour, it is clear that the world of management may have to wait a long time before it has a dispassionate understanding of the managerial interactions of high level specialists. And it is particularly important that, in this state of ignorance, we do not accept as final evidence mere reminiscences or unverifiable opinions.—PROF. R. W. REVANS, head of the Department of Industrial Administration, Manchester University, and a member of the Institution of Mining Engineers, in an article in Works Management, journal of the Institution of Works Managers.

Paradoxically, industry is full of young men ambitious to become executives because the executive is a central figure in the social and economic life of the country. Unfortunately, it is not as easy as the young men see it. Natural-born executives are rare, although the nation has its share.—MR. RONALD S. BUMSTEAD, *in Works Management.*

Tendering for complete industrial plants is an expensive business. Preparing a tender for a nuclear power station will involve costs running to six figures, and tenders for integrated units such as steelworks or refineries may cost many thousands of pounds. Too great a dispersal of effort in quoting can therefore easily erode the profits made on existing contracts.—MR. ANTHONY NEVILLE, export director of Head, Wrightson & Company, Limited, in a special article in the Financial Times.

The British are largely a nation of potterers about the home and garden, linked to the world outside through the television screen and the motor car.—MR. BRIAN GROOMBRIDGE *in his booklet "Education and Retirement."*

The monolithic structure of trade unionism is cracking. With it is going a good deal of the former authority of the national trade unions themselves and of the TUC. . . The days when a comparatively small group of general secretaries consulting with a similar group of employers and Government spokesmen could reach agreement on wage and industrial policies, whose writ would run over most of the industry, are almost certainly past.—FRANCIS WILLIAMS in a special article in the Sheffield Telegraph.

Many companies are now selling overseas as casually as they sold to Nottingham and Glasgow, although a few years ago they hardly knew the difference between a letter of credit and a bill of lading.—MR. F. J. ERROLL, *Minister of State, Board of Trade.*

The South Wales miners' eisteddfod attracts people from all over the country. It is so successful that we cannot find a place big enough for it. We are not satisfied in South Wales with rock 'n roll and suchlike. I think our heritage is William Morris, Shakespeare, and Shaw, and in music, Vaughan Williams and Benjamin Britten.—MR. W. WHITEHEAD, president of the South Wales Area of the National Union of Mineworkers, at the Trades Union Congress.

Why, oh why, can't this Government get down to a national fuel and power policy which will capture the imagination of the coal, gas, electricity, atomic power, and hydro-electric energy industries? —MR. SAM WATSON, *in the annual report of the Durham County Mining Federation.*

NCB Chairman on Coal Situation

SPEAKING at a meeting on Wednesday of the North of England branch of the National Association of Colliery Managers, Sir James Bowman, chairman of the National Coal Board, said that if the board was to compete and maintain its position in the country's fuel markets it was inevitable that there should be some contraction in its size and a concentration of the most efficient collieries.

To achieve the two main objectives of producing coal at levels of efficiency high enough and levels of cost low enough to compete with the oil companies, and the marketing of the industry's products in the form and consistent quality demanded by consumers, a tremendous and sustained effort would be needed.

He revealed that in the first six months of this year oil was replacing coal at the annual rate of 38,000,000 tons—an increase of 22,000,000 tons over 1956. Prospects for the long term were that a solid nucleus of the industry would be devoted to supplying steam-raising coals for electricity generation. "The demand for coal in power stations may rise into the region of between 80,000,000 and 90,000,000 tons in the late 1970s compared with 46,000,000 tons last year," he said. Increased efficiency and a determination to produce the fuel which a changing economy demanded would guarantee a bright future for the industry.

"From 1965 onwards, providing industrial activity continues at a high level and that the economy expands at the forecast rate, coke ovens should consume at least 35,000,000 tons a year, compared with 27,000,000 tons in 1959."

The demand from the domestic market for coal and premium solid smokeless fuel should by 1965 be in the region of 27,000,000 tons a year. But in markets such as the gas industry, the railways, general industry, and other miscellaneous users with whom oil had made headway, it must be expected that some decline was inevitable.

Pessimists Who Leave Pits "Causing Others Worry"

PESSIMISTS who were leaving the coal industry because they saw no future in it were causing others unnecessary worry and making it increasingly difficult for the industry to solve its problems, said the Minister of Power, Mr. Richard Wood, at Whitehaven (Cumberland) on Tuesday. He was answering local miners' leaders who had expressed fears arising from the closure of uneconomic pits and the rapid decline in manpower.

So far this year 500 men have left Cumberland pits, out of a labour force of 4,500, to seek employment in other industries. The Minister said that there was a big future in coal, so long as costs were brought down and production made profitable. However, excessive faulting in Cumberland made it difficult.

Mr. Wood had previously inspected the methane drainage plant at Haig Colliery, Whitehaven, the first in Britain to extract gas from the workings and use it to fire the boilers. On Monday he had visited Kinghill No 3 Colliery, near Shotts (Lanarkshire), and also the tube works at Bellshill of Stewarts and Lloyds, Limited.

DEARER COAL

Industry Greets Increases "with Dismay"

RISE in the price of coal was announced by the National Coal Board yesterday (Thursday). The overall average increase per ton will be about 6s. 8d. and ranges from 5s. 1d. per ton for the electricity industry to 10s. 1d. for naturally smokeless coals. The new prices come into force on Monday. Making the announcement the board points out that it has held the general level of coal prices unchanged for over three years—since July 1, 1957. Since then annual consumption had gone down by almost 30,000,000 tons. Reductions in costs from economies and improvements in efficiency were now running at the rate of £50,000,000 this year, compared with 1957.

Savings only partly offset some of the very heavy financial burdens. There had been increasing charges to bear and the industry had faced increased rates for day-wage men, a sick pay scheme, and improved redundancy compensation. The board had a £24,000,000 deficit last year and had to face a further serious increase in costs as a result of the recent arbitration award of an increase in the wages of day-wage men, and other employees, and account must be taken of the award of reduced hours for underground and surface workers.

These heavy additions had left the board no choice but to increase the inland prices of coal to yield additional revenue of about £60,000,000 in a full year. The Domestic Coal Consumers' Council had expressed the view in discussions on the board's proposal, that orders for house coal placed before the announcement should be met at the price ruling at the time the orders were placed. The board had agreed to this as far as its own retail business was concerned and was discussing the matter with the distributive trade.

Still Cheapest Source of Energy

The increases would not be uniform and would vary within the different categories of consumers as follows:—Gas, 6s. 8d.; electricity, 5s. 1d.; coke ovens, 8s. 11d.; railways 10s.; iron and steel, 6s. 1d., house coal, 10s.; naturally smokeless coals, 10s. 1d., other inland consumers, 7s. 1d. The figures will vary within each category according to the type and quality of coal supplied. In the case of house coal the increase will be applied equally to each of the seven quality groups.

Finally the NCB emphasizes that even with the increases coal still remains the cheapest source of energy for industry and heat for the home when used in modern equipment.

The new prices would add approximately 10s. a ton to the cost of making steel, the British Iron and Steel Federation stated. It was not calculated to help the industry at a time when the Government was pressing for increased exports. The substitution of other fuels for coal in steel production would probably be quickened by the increases.

A statement by the National Gas Council said the price of gas coke would be increased by about 6d. per cwt.

For the Federation of British Industries, a spokesman said it was difficult to understand how the board could justify the very substantial increase. It would be greeted by industry "with dismay and indeed horror." It seemed little short of fantastic that the Government should sanction such substantial increases in the price of coal, which were bound to release the coil spring of a fresh bout of inflation, just at a time when industry was being exhorted to launch a new export drive in the teeth of fierce world competition.

A similar line was taken by the National Union of Manufacturers which said that from the national viewpoint the increases must be regarded "as disastrous" when stable prices at home and competitive prices for export were twin necessities. "The cost of coal underlies the whole structure of industrial prices and this staggering increase is utterly incompatible with the Government's declared objectives."

The Chamber of Coal Traders "regretted the circumstances which had forced the board to increase the price of coal after three years of stable prices, but agree that the board needs increased revenue."

It seemed to the National Union of Mineworkers, said its general secretary, Mr. Will Paynter, that the present heavy burden on the NCB should be the responsibility of the State. Consumers were now going to have to pay for the failure of the Government to meet its obligations to the industry.

Derwenthaugh Coking Plant Ovens Lighted

FIRST step in bringing into operation two batteries, comprising 38 coke ovens, which have been rebuilt at Derwenthaugh Coking Plant, Blaydon (Co. Durham) was taken on Wednesday with the lighting of the ovens, performed by Mrs. A. H. Kellett, wife of the deputy chairman of the Durham Divisional Coal Board. Lighting the ovens starts the drying out and heating process which continues for several weeks until the temperatures are high enough for carbonizing coal. The ovens will go into production to meet Tyneside's demand for gas during the coming winter and to maintain Durham's output of foundry coke.

Durham's carbonization industry is now at a high rate of efficiency following a programme of reconstruction and replacement started in 1952. Last year Durham Divisional coke ovens carbonized 3,300,000 tons of coal, from which were produced 2,300,000 tons of coke; 143,000 tons of crude tar; 28,000 tons of sulphate of ammonia and 8,700,000 gallons of crude benzole, as well as nearly 20,000,000,000 cu. ft. of gas for towns' use in the North of England.

Obituary

Distinguished Electrical Engineer

SIR ARTHUR FLEMING, the distinguished electrical engineer, died on Wednesday at his home near Shanklin, Isle of Wight. He was 79. His work helped to make radar possible, and in the early part of the century he was one of the first to realize the need for scientific research into industrial problems and the effective technical training of staff.

He played a big part in the development of a technique for high vacuum, high-voltage equipments, and demountable, large-power thermionic valves which helped to make radar possible. For his work in submarine detection during the 1914-18 war he was awarded the OBE and later the CBE, and in 1945, for his services to education, received his knighthood.

Sir Arthur developed the works school and apprenticeship systems for which Metropolitan-Vickers, Limited, of which he was once director of research and education, is famous. He sat on a number of committees and in the two world wars did leading work on radar and anti-submarine equipment. He was associated with many scientific and industrial societies, and was a past president of the Institution of Electrical Engineers. He was awarded the Institution's Faraday Medal in 1941.

MR. F. G. ATHERTON

A LEADING authority on mining and shaft sinking techniques, Mr. Frederick George Atherton, died on Sunday at his home in Doncaster. He was 59. Until May this year, when he relinquished his directorships because of ill health, Mr. Atherton, a member of the Institute of Mining Engineers, was a director of the Cementation, Limited, group of companies and joint managing director of a subsidiary, Cementation Contracts, Limited. He was retained as a consultant by the company up to his death.

He was closely associated with the Kariba Dam project in Africa, the group's undertakings in India, and, during the past three years, with the efforts to render safe the water-affected shaft which caused the temporary close down of Thorne Colliery, near Doncaster. He joined the Cementation group's predecessor, Francois Construction, Limited, at Bentley (Yorks) in 1927.

MR. J. D. CARMICHAEL

CHAIRMAN of the North of England Ironfounders' Association, Mr. James Duncan Carmichael, has died at the age of 69. He was chairman of Carmichael Bros., Limited, the South Shields (Co. Durham) firm of ironfounders which his grandfather started in 1860.

Mr. Carmichael was a past president of the Newcastle and District branch of the Institute of British Foundrymen, and both president and secretary of the North-east branch of the Institution of Mechanical Engineers. He was also a past president of the National Ironfounding Employers' Federation and a vice-president of the Council of Iron Foundry Associations.

MR. J. G. WIDDOWSON

THE death has occurred of Mr. James George Widdowson, vice-president of the Neepsend Steel & Tool Corporation, Limited, Sheffield. He was 70, and was one of the original directors of the Neepsend Corporation.

He became managing director in 1955 in place of Sir Stuart Goodwin, who had resigned as managing director but retained the chairmanship. Following reorganization in 1959, Sir Stuart became president, and Mr. Widdowson vice-president. Mr. Widdowson was also managing director of Jonas & Colver (Novo), Limited, steelmakers, of Sheffield, a firm with which he had been actively associated for many years.

The death has occurred of Mr. ALBERT HOLROYD, senior sales manager of Levick (Swift) & Sons, Limited, steel manufacturers, of Sheffield. He was 66.

Mr. JOHN BARLOW, cashier with William Pack & Company (Forgemasters), Limited, Wigan, until retirement in 1947, has died at the age of 78. He served the firm for 52 years.

Mr. SIDNEY BLOOR, director and works manager, Gill & Russell, Limited, tubes and fittings manufacturers, of Walsall, has died at the age of 54. He was 40 years with the company.

Mr. HUGH MONTGOMERIE LANG, founder of the firm of H. M. Lang & Sons, Limited, iron and steel and hardware agents, of Glasgow, has died at the age of 88. He was the Scottish representative for Rylands Bros. Limited, wire manufacturers, of Warrington.

For some years undermanager of two Derbyshire collieries, Renishaw Park and Furnace Hill, and from 1937 until his retirement in 1955 safety officer at Orgreave Colliery, Handsworth, Sheffield, Mr. Willie Cooper, has died at the age of 71. He had also been undermanager at New Stubbin and Wombwell Main collieries in Yorkshire.

Lt. Col. GEOFFREY REGINALD DEVEREUX SHAW, who has died at his home at Norwich at the age of 64, was from 1924 to 1929 chairman of South Kirkby, Featherstone & Hemsworth Collieries, Limited, which was founded by his grandfather, Mr. John Shaw. The company later became the South Kirkby Investment Company, Limited, Col. Shaw remaining a member of the board. He was also a director of Begwaco Meters, Limited, L.C. Engineering Supplies, Limited, and a number of other companies.

Mr. WILLIAM VANCE WRIGHT, who was a director and general manager of John Brown Land Boilers, Limited, Clydebank, until his retirement last year, died recently at the age of 58. He joined John Brown & Company (Clydebank), Limited, in 1950 as commercial manager in London of its land boiler division. When the division and the Whitecrook (Clydebank) works of the company merged and became John Brown Land Boilers, Limited, in 1954, Mr. Wright was appointed a director and general manager.

ANOTHER STEEL DEAL

Staveley Iron & Chemical Sold for £6,000,000

BRITAIN's second largest State-owned steel company—the Staveley Iron & Chemical Company, Limited, Staveley Works, near Chesterfield—has been sold by the Iron and Steel Holding and Realization Agency to Stewarts and Lloyds, Limited, steel tube, iron pipes and castings, and steel makers, of Glasgow. The entire issued share capital of Staveley Iron has been purchased by Stewarts and Lloyds for £6,000,000, which, it is understood, will be financed from the group's own resources and by arrangements with its bankers.

Staveley Iron was formed by the Staveley Coal & Iron Company. Limited (now a holding company), as a wholly-owned subsidiary in 1948 and Staveley Iron passed into public ownership in 1951. After arbitration proceedings in 1952 the parent company was awarded £8,200,000 compensation.

In 1955 Staveley Iron bought from ISHRA the whole of the issued share capital of the Sheepbridge Company, Limited, Chesterfield iron and steel makers, for £2,175,387 (the compensation value). Three iron-ore companies, Byfield Ironstone Company, Limited, Cranford Ironstone Company, Limited, and Loddington Ironstone Company, Limited, which passed into public ownership in 1951, have since become subsidiaries or associates of Staveley Iron.

Substantial Recovery Expected

Over the last three years the profits of Staveley Iron have fallen from £1,800,000 in 1957 to £1,200,000 in 1958, and to £652,969 in 1959, but a substantial recovery is expected in the current year's results. It is second in importance to Richard Thomas & Baldwins, Limited, among the companies still State-owned.

Earlier this year the Minister of Power, Mr. Richard Wood, asked about the disposal of RTB, replied that this might be best carried out when its present large-scale development plans were further advanced and there were more tangible signs of the company's earning capacity. The Government had to decide whether to give priority to selling RTB or to completing the divesting of the "prior charges" of companies already denationalized.

The announcement of the disposal of Staveley Iron brought an immediate protest from Mr. Frederick Lee (Lab.), Opposition spokesman on the steel industry. "The Government's credit squeeze policy of dear money has made this the worst time to sell the steel undertakings," he said. "The Government knows quite well that it is dissipating public assets for no other reason than its determination to sell at any price. It is quite barmy."

Promising a "showdown" when Parliament reassembles on October 25, Mr. Lee said that the loss to the Exchequer of £2,000,000 followed another loss of £1,500,000 for the Llanelly Steel Company, Limited, which was sold a few weeks ago.

Stewarts and Lloyds on Tuesday sent a letter to all Staveley Iron employees indicating that it would honour all of the Derbyshire concern's obligations, including its pension commitments. Two directors of Stewarts and Lloyds, Mr. L. M. T. Castle, managing director, finance and general administration, and Mr. N. C. MacDiarmid, managing director of Stanton Ironworks Company, Limited, have been appointed to the seven-man board of Staveley Iron.

Commenting on the take-over price of £6,000,000, a spokesman for the works committee of the Amalgamated Engineering Union, whose members are employed by Staveley Iron, said: "We feel that this has been given away. The company was only marking time with its orders, but it was worth at least what the Government paid for it—and that was over £8,000,000."

UK Steel Output Rise in August

PRODUCTION of steel in August was still affected by the summer holidays. It reached an average of 422,900 tons a week compared with 391,400 tons a week in July, and with 337,100 tons a week in August, 1959. The production of pig-iron was at an average of 291,400 tons a week compared with 288,900 tons a week in July, and with 219,600 tons a week in August, 1959.

Imports of steel have continued to rise, and in the first seven months they amounted to nearly 1,000,000 tons, valued at £63,000,000—three times as large as in the same period of 1959. Steel sheet, mainly for the motor industry, accounted for about half the imports.

Latest pig-iron and steel output figures (in tons) with the corresponding 1959 returns, are shown in the following table:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1960—June.. ..	295,200	15,353,000	464,400	24,255,000
July.. ..	288,900	15,024,000	391,400	20,355,000
August ..	291,400	15,152,000	422,900	21,988,000
1959—June.. ..	235,000	12,235,000	388,500	20,200,000
July.. ..	221,600	11,521,000	320,000	16,654,000
August ..	219,600	11,418,000	337,100	17,527,000

Mr. A. C. BARLEY, who died on Thursday of last week at the age of 64, had been employment officer of the English Steel Corporation, Limited, for more than 30 years and had served on a number of committees of the Sheffield and District Engineering Trades Employers' Association.

Personal

Member of CIS for Half a Century

FORMER joint managing director of the Parkgate Iron & Steel Company, Limited, Rotherham, Mr. T. W. EDWARDS celebrates this year a half century of membership of the Sheffield branch of the Chartered Institute of Secretaries.

MR. T. W. EDWARDS

Mr. Edwards, who joined the company in 1898, retired from the post of joint managing director in 1953 but continued as a special director and consultant. Born in 1883, Mr. Edwards was, for some time, private secretary to the then chairman of the company, Sir Charles Stoddart. He was later appointed secretary to the company and also commercial manager. He became assistant managing director in 1945 and joint managing director in 1948. He has served as a member of the standing committee of the Light Rolled Steel Products Conference of the British Iron and Steel Federation.

The CIS in Sheffield continues it association with the iron and steel industry in its chairman for 1960-61—Mr. R. R. Ellerby, secretary and a director of the Sheffield Smelting Company, Limited, Mr. Ellerby is also a director of F. Claudet, Limited, makers of electrical contacts, etc., of London, E.C.1, and Yorkshire Aluminium, Limited.

Mr. JOHN RANKIN has retired after 21 years as secretary of Blackburn Miners' Welfare Society, West Lothian.

Mr. T. L. GARNER, chairman and managing director of Precision Rubbers, Limited, makers of rubber mouldings and extrusions, of Bagworth (Leics), has been elected president of the European Federation of Purchasing.

Apprentice school at the Bridgeton, Glasgow works of Davy-United, Limited, was opened last week by Mr. M. A. FIENNES, managing director of the Davy-Ashmore, Limited, group. The school will handle up to 20 first-year apprentices each year.

Two apprentices, Mr. DAVID CHALKER (21) and Mr. ROGER WEBB (23), with Simms Motor Units, Limited, diesel and electrical engineering specialists, of East Finchley, London, have become Bachelors of Science, having been sponsored in their examinations by their employers.

Mr. A. WHITTAKER, managing director of Keeton, Sons & Company, Limited, manufacturers of sheet metal working machines and machine tools, of Sheffield, has left for a three weeks' business tour of North America, during which he will visit the Chicago Machine Tool Exhibition.

Laboratory assistant with the Morgan Crucible Company, Limited, Battersea, London, Mr. JAMES H. FAIRWEATHER, has been awarded £225 under a suggestions scheme run by the company. His alteration to the cooling system of a laboratory furnace will save about 10,000,000 galls. of water a year and represents an annual saving to the company of £400.

Mr. JOHN MCCALLUM, Area civil engineer for the West Fife Area of the Scottish Divisional Coal Board, has retired after more than 50 years in the industry. He started work with the Fife Coal Company, Limited, in 1910 and from 1919 to 1922 was chief assistant in the Kelty district survey department. In 1922 he transferred to Cowdenbeath, and was in charge of civil work in connection with reconstruction and extensions at collieries and brickworks.

Six Sheffield metallurgical and steel experts will lecture at a symposium organized by the Iron and Steel Institute at the Hoare Memorial Hall, London, from November 30 to December 2. They are Prof. A. G. QUARRELL, Dr. J. A. WHITEMAN and Mr. J. E. HARRIS, of Sheffield University; Mr. J. D. MURRAY and Mr. K. J. IRVINE, of the United Steel Companies, Limited, Sheffield; and Mr. J. E. RUSSELL, of the English Steel Corporation, Limited, Sheffield.

Mr. E. J. HILL, secretary of the United Society of Boilermakers, Shipbuilders, and Structural Workers, was elected chairman of the Trades Union Congress general council for the coming year at a meeting of the council last week. Mr. Hill, who is 61, joined the society at 17 and has held many offices in his union, becoming general secretary in 1948.

Higher Dividend and Capital Increase By Newton, Chambers

DIRECTORS of Newton, Chambers & Company, Limited, ironfounders, engineers, chemical manufacturers, etc., of Thorncliffe, near Sheffield, propose to increase the authorized capital from £3,000,000 to £3,500,000, to subdivide the £1 ordinary shares into units of 5s. each, and to offer to ordinary holders rights on a one-for-eight basis. Details will be announced shortly.

The company is raising its interim dividend by 2 per cent. to 8 per cent. in respect of 1960 and, from results to date, it is expected, subject to no unforeseen circumstances arising, that the board will recommend a dividend at a total rate of 20 per cent. for 1960. The 1959 total was 17½ per cent.

The additional capital is required to repay short-term borrowings. In recent years the group has greatly extended its activities and increased its fixed assets and working capital, mainly out of its own resources.

South Durham Steel & Iron's New Plate Mill

AFTER a short period of experimental rolling, the new plate mill of the South Durham Steel & Iron & Company, Limited, at its South Works, Greatham, near West Hartlepool, has now gone into limited commercial production. The mill, almost half a mile long, is the largest of its kind in Europe and it has been completed several months ahead of schedule.

The first plates rolled went to the firm's malleable works at Stockton. At the moment only about 40 men are working a day shift at the mill, but eventually it will run on a round-the-clock schedule and will produce in the region of 17,000 tons of plate a week.

FUTURE OF SCOTS COALFIELD

BIG INCREASE IN MANPOWER NEEDS NEXT YEAR

AFTER two years of restrictions, the Scottish Divisional Coal Board intends to take in 8,000 extra miners in 1961—four times the number recruited last year. "The tide has turned in Scotland. After two years which have seen 34 pits close and manpower cut by 15,000 we have reached stability," said Mr. L. R. Milligan, industrial relations director for the divisional board, last Friday. The board intends to recruit 2,500 juveniles next year and also expects that between 2,000 and 3,000 ex-miners will rejoin the industry. The remainder of the 8,000 jobs will be filled by inexperienced men, who will be given training.

Mr. Milligan said: "The sole reason for this intake will be wastage, which has always been high with the mining industry. In 1955, for example, the rate was 9,000 a year. Currently, it is 8,000 a year. As we no longer have the same problem with redundant miners—only 140 out of 7,000 affected by closures are still unplaced—the restrictions on recruiting must be lifted."

Although the great majority of the "dead wood" had been cleared away, certain pits would still have to shut down, some because of exhaustion and others because of the poor quality of their coal. The new pits were steadily coming into the picture. Pits where coals of unacceptable quality were produced would not be continued. "Very few miners however will be asked to move from coalfield to coalfield. Most of the changes will be to pits in the Area."

New Sinkings

No more than 1,500 miners would be affected by closures next year, said Mr. Milligan. In 1959, 5,000 men were affected as 27 pits shut down. He referred to the big new sinkings, which had cost millions of pounds, and which would continue to produce coal at an accelerated rate. He described them as the "investment in the future on which the miners can depend." By 1965, four out of every five tons of coal mined in Scotland will come from the new or completely reconstructed pits. Manpower, currently at 71,000, is expected to drop to about 65,000 by 1965, but this will be wastage. Productivity will continue to rise.

"I know we cannot look in a crystal ball, but it appears to me that we can see stability throughout the Scottish coalfield," said Mr. Milligan. The future of the industry in Scotland is secure, and men can look forward to permanent employment."

A secure future for the West Fife coalfield was predicted by Mr. William Rowell, NCB Area general manager, at a Press conference at Cowdenbeath last week. He believed that output and employment would be maintained in the whole Fife coalfield north of the River Forth. Because of the present wastage rate of between 30 to 40 men a week, they were not getting enough juvenile recruits. In West Fife area, the problem was concentrated in pits west of Dunfermline, including Comrie, Blairhall and Valleyfield collieries.

He added: "We will almost certainly find that juvenile and re-entrant recruitment will be insufficient for these pits, and so far as we can see at present we will have to recruit, in addition, adults for training."

Coal Still Cheapest Fuel, Says Group Chairman

THERE is a general feeling with the public that coal is a rapidly dying industry or, to say the least, that it is unfashionable, but this is by no means the case. Mr. John Waddell, chairman of Amalgamated Anthracite Holdings, Limited, tells shareholders. Properly prepared coal, burned in efficient modern appliances, is still in most cases the cheapest form of heat, power, and steam generation, he says. Coal is still the basis of the largest part of heat and power generation in the UK, and by all standards looks like remaining so. "Our own activities in the distribution of solid fuel are very substantial and, if anything, are tending to expand."

Mr. Waddell says that there is an extensive drive to encourage householders to a better standard of heating, and there seems little doubt that there will be a progressive increase in central heating installations. The group welcomed in this connection the National Coal Board's house warming plan, and was following it up energetically. In the export field, the group had maintained satisfactory activity, considering the general lack of demand in Europe due to excessive stocks. On the other hand, the group's importing and distributive organizations abroad felt the impact of price cutting from Poland and other countries, and as a result had to operate on much narrower margins. Group profits from its oversea companies therefore showed a substantial decline.

The engineering companies within the group suffered a severe setback in 1959 and only now were they beginning to emerge from a very difficult trading pattern. Although there was little hope of the wagon repairing section returning to its old level, the Power Plant Company, Limited, was again receiving orders at a higher level.

There is a much more satisfactory picture of expanding activity in most of the group's products and a healthier background altogether as a result of reorganizations which took place during 1959. In the early part of 1960, several activities were still not completely out of trouble and even trading at losses, although on a diminishing basis. Despite this, the profits of the group for the first half of 1960 show a very useful improvement, and Mr. Waddell sees no reason why this improvement should not be maintained through the rest of 1960.

METALIFE CORROSION, LIMITED—Mr. D. H. du Rieu has joined the board.

Orders Placed

More Coke For Steelmaking

ORDERS have been received by the Woodall-Duckham Construction Company, Limited, to build two new coking plants together valued at over £4,000,000. One order is from Colvilles, Limited, which has commissioned two further batteries of coke ovens with complete coal and coke handling systems and a by-products recovery plant for its Ravenscraig Works. This new plant will have a coke output capacity equal to that of the plant at present under construction so that, by the end of 1962 when all six batteries will be in operation, the Ravenscraig Works will be processing 1,750,000 tons of coal annually.

The other new coking plant to be ordered is for the United Coke & Chemicals Company, Limited, branch of the United Steel Companies, Limited, at Orgreave. The contract includes the demolition of a derelict battery of ovens and the building of a new battery of 43 ovens with by-products recovery and benzole plants and a gas boosting plant. Demolition work is already in progress and the building of the new installation will be completed by the end of 1962.

CONTRACT for the construction of a $2,500,000 aromatic extraction plant at the Montreal East refinery of British American Oil has been awarded to Foster Wheeler, Limited, London, S.W.3.

CONTRACT worth £1,000,000 has been awarded to Murdoch MacKenzie, Limited, Motherwell, by Colvilles, Limited, for civil engineering work in connection with a new plate mill at Clydebridge Steelworks, Cambuslang, Glasgow.

ORDER worth about £150,000 has been received by Rolls-Royce, Limited, for diesel engines and torque converters to power 50 new single-engine shunting locomotives to be built for the Swedish State Railways by Kalmar Verkstads A.B.

CONTRACT for a "Flash" steam plant, valued at £150,000, has been obtained by Bennis Thermoflash, Limited, Little Hulton, Walkden, Manchester. The plant is for the New Zealand Government and will form part of the geothermal project at Wairakei, North Island.

PREFABRICATION of 2,500 tons of steel for Britain's tallest office block, the Co-operative Insurance Society building in Manchester, which is to have a 25-storey tower, is to be carried out by Alexander Findlay & Company, Limited, Motherwell. The order is worth £200,000.

SACK OUTLOADING plant is to be designed, manufactured, and erected by Spencer (Melksham), Limited, for the Government of Ghana. The plant will be used in connection with the shipment of sacks of cocoa beans and the £450,000 contract is part of the Tema harbour development scheme.

CONTRACT for two 48-in. suspended "Allen-Stork" mixed-flow condenser circulating-water pumps and motors for Calgary Power Company, Limited, Canada, has been awarded to W. H. Allen, Sons & Company, Limited, Bedford. The pumps, which are rated at 37,800 gallons per minute each, are driven at 393 r.p.m. by 500-h.p., 60-cycle motors.

FOUR-CYLINDER diesel engines for use in German-built fork lift trucks are to be supplied by Perkins Engines, Limited, Peterborough. The order is worth nearly £150,000 and has been placed by Ruhr Intrans Hubstapler, GmbH, Mulheim. The engines will be fitted in the US-designed Clarklift 2½- and 3½-ton fork lift trucks manufactured by the German company.

GRANGE DOCK, Grangemouth, is to have 22 new electric cranes. An order for 16 6/3-ton. and two 10/3-ton cranes has been placed with Stothert & Pitt, Limited, Bath, by British Transport Docks, while four 7½/4-ton units capable of dealing with general traffic or discharging bulk dry cargo by grab are to be supplied by Cowans Sheldon & Company, Limited, Carlisle.

ORDER has been placed by the North-Western Divisional Coal Board with Heyes & Company, Limited, Wigan, for an initial quantity of 500 flameproof lighting fittings for installation at the new Parkside Colliery, Newton-le-Willows (Lancs). Heyes has already supplied two 5-level Wigan type 40 shaft signalling indicator systems which will be installed in the No. 1 shaft at Parkside.

TENDER of £27,257 submitted by Thos. W. Ward, Limited, Sheffield, for the construction of crane and railway tracks at the No. 1 and No. 2 deepwater berths being built at Lackenby (Yorks) has been accepted by the Tees Conservancy Commission. The work is to be undertaken by the Darlington Railway Plant & Foundry Company, Limited, a Thos. W. Ward subsidiary.

VALUED AT more than £500,000 a contract for the 33 kV and 11 kV cable installation of the new Spencer steelworks of Richard Thomas & Baldwins, Limited, Newport (Mon), has been awarded to Associated Electrical Industries, Limited, whose construction (cables & lines) division will begin work at the site shortly. The contract comprises 15 miles of 3-core and approximately 2½ miles of single-core 33 kV solid type cables, 20 miles of 11 kV 3-core cables and 4 miles of 11 kV single-core cables.

David Brown is to Make Bingham Pumps

FOUNDRIES division of David Brown Industries, Limited, Penistone (Yorks), is to make and market pumps to the design of the Bingham Pump Company, of Portland, Oregon, US. Pumps of the double volute horizontal single-stage centrifugal type, which the UK company will market in the eastern hemisphere, with the exception of Australia, New Zealand, and part of Japan, are covered by the agreement.

David Brown states that with the development of the double volute construction which will be embodied in all David Brown-Bingham pumps, hydraulic radial balance has been established, eliminating deflection of the rotating element throughout the entire operating range.

CKS GROUP BUYS TINPLATE WORKS

WORKS of the Avondale Tinplate Company, Limited, at Pontnewydd (Mon), which closed two years ago due to lack of orders, has been acquired by the CKS Group, Limited, a Port Talbot firm which controls a number of companies in steel scrap, demolition, and associated work. All the buildings on the site are to be demolished, making it available for fresh use.

The CKS Group states that it may use the site for its own development, but no decision will be made until after demolition work is completed.

Progress on Spencer Works

PRODUCTION DUE TO START IN ANOTHER YEAR

CONSTRUCTION of the new Spencer steelworks of Richard Thomas & Baldwins, Limited, at Llanwern, near Newport (Mon) is gaining speed, and production is due to begin there in another twelve months. From the few pioneer men and machines which began work on the site in August last year, the labour force has risen until now there are over 4,000 men working with thousands of pounds worth of plant and machinery. The year has been a demanding one for both RTB and the contractors' staff, as week by week parts of the overall programme have been completed.

Already from the foundations recognizable areas of the new steelworks are visible, reports Ingot News, the company's newspaper. The first blast furnace, with attendant hot blast stoves, is taking shape, and coke ovens are in an advanced stage of construction. On the site, lorries have now delivered some 5,000,000 cu. yds. of fill needed to raise the level of the ground, and piles driven to take the heavy foundations of the works total more than 50,000, while over 75,000 cu. yds. of concrete has been placed.

Entrance to the site has been improved. A double-Bailey bridge over the main railway line has been in use for several months, and a new industrial road being built by Newport Borough Council will lead to a roundabout near the south-west corner of the site. From the roundabout, a road will connect with the works. The industrial road is expected to bridge the main railway line by mid-November.

Apart from 11 miles of railway track already laid within the site, British Railways has completed junctions with the works lines and the main line. Work is also proceeding with a rail flyover at the eastern end of the site for traffic leaving the works. On the site itself, a new RTB staff dining room block (opened last month), an apprentice training centre, a medical centre, and the temporary offices provide the administrative buildings. RTB staff alone now totals 450.

Further contracts for installations at Spencer works have been allocated. Holloway Brothers, Limited, is to build 120 elongated caissons for foundations at a cost of £500,000. The work is scheduled for completion in 20 weeks. Site workshops and general miscellaneous engineering services are to be erected by Powell Duffryn Engineering Company, Limited, Cardiff, under a £300,000 contract.

Restrictive Practices Court

AMONG the dates fixed for hearings by the Restrictive Practices Court are the following:—Steel kegs and drums, October 4; electrical transformers, November 21; cement, January 16, 1961, and wire nails, March 6, 1961.

New First-aid Requirements for Factories

PEOPLE in charge of first-aid boxes in factories employing more than 50 workers will in future have to be registered nurses, enrolled assistant nurses, or people holding a first-aid certificate issued within the three previous years by a training organization. This requirement is laid down by the Minister of Labour in an Order amending the Factories Act, 1937.

Training organizations designated in the Order are the St. John Ambulance Association, the St. Andrew's Ambulance Association, and the British Red Cross Society. Factories with their own training organizations may be approved by the Chief Inspector of Factories where standards are comparable to those provided by the designated organizations.

To allow firms time to bring their first-aid workers up to the required standard, the regulations will not come into force until July 1, 1961, and until the end of December, 1962, a person shall be deemed to be properly trained if at any time during the last 10 years he has held a first-aid certificate issued by a training organization.

Details of the names and qualifications of the people in charge and of the date on which evidence of their training was last inspected by the occupiers of the premises will have to be entered into or attached to the general register maintained by the factory under the Factories Acts.

Denmark to Roll Norwegian Steel

NORWEGIAN State-owned steelworks, A/S Norsk Jernverk, has awarded a contract for the rolling of its ingot slabs into heavy plates to Det Danske Staalvalsevaerk, the Danish steelworks and rolling mill. Deliveries of slabs are to begin in the second half of next year and the contract provides for the rolling of up to 40,000 tons of plates, mainly ship plates, annually. Norsk Jernwerk plans to sell the plates on the home market.

The Norwegian concern is in the middle of an expansion scheme to increase steel output capacity considerably, but it has no rolling mill for heavy plates and no immediate plans for building one. The Danish company, on the other hand, has recently completed such a mill and has surplus rolling capacity.

IME Associate Membership Examination

IN the examination for associate membership of the Institution of Mining Engineers held in May, the following were successful:—

D. Aldersea, A. E. Alexander, S. P. Banerjee,* K. Barber, M. Barclay,* C. Barnes, J. M. Bennett,* D. B. Bradford, T. Brereton, E. J. Browning,* P. J. Bumby,* A. T. Campbell, R. A. Caunt.

B. J. Collins, H. Corfield, B. Crossland, J. K. Dixon, D. Drake, D. B. Edwards,* R. S. Evans, I. W. Farmer, R. Foster,* F. S. Gill, W. S. Glen, J. H. Glew, J. Goulding, A. Griffin, M. Z. Haque, K. P. Hess, D. J. Hodges, N. Hogg, D. Holland, R. P. Hughes, A. K. Isaac,* I. J. Jaquest,* I. C. Jeffrey, S. N. Jha,* R. T. Jones,* T. J. Jones.

G. M. Kirkwood, C. J. Linney, P. N. McDermott, M. J. McParlane, J. L. M. MacSporran,* E. J. Manship, J. Mason,* P. Murphy, G. Nicholson, D. B. Owen, J. C. Pemberton,* F. F. Petrie, J. C. Reynolds, A. Robinson, G. C. Rowlands, I. M. Rowlands, B. Sarcar, V. K. Sarna,* F. D. Scott, P. M. Scott,* K. Sedgebeer,* M. J. Shotton, B. Singh,* J. Smith, R. Sorbie, R. Stephenson, M. Stevenson,* W. J. Stott,* J. Taylor, D. N. Thomas,* G. B. Turner, J. B. Wallace, H. B. White.*

The following candidates referred in mining legislation in 1959 have now completed the examination:—W. Foster, R. J. Gregory, L. Halliday, A. Ingham, and S. Jha.

The next examination will be held jointly with those of the Mining Qualifications Board on November 15, 16, and 17 at the following centres:—Cardiff, Doncaster, Glasgow, Stoke-on-Trent, Sunderland, and Wigan.

Forms of application and full particulars may be obtained from the secretary at 3, Grosvenor Crescent, London, S.W.1. The latest date for the acceptance of entries is September 21.

* Subject to passing in Mining Legislation at the First Class Certificate of Competency examinations of the Mining Qualifications Board.

Safety Standards Maintained in Derbyshire Pits

DENIAL that there had been any lowering of safety standards in Derbyshire mines as a result of a reduction in the number of miners authorized to carry safety lamps was made on Wednesday of last week by a spokesman of the East Midlands Divisional Coal Board. There had been some reduction, he said, but every man whose job required him to carry a safety lamp still carried one.

The statement was made in reply to an accusation by Mr. Bert Wynn, secretary of the Derbyshire branch of the National Union of Mineworkers, that the board had reduced the number of safety lamps because under a new agreement the men who carried them were entitled to an extra shilling per shift.

OY VUOKSENISKA steel concern, Imatra, Finland, has ordered from Demag, West Germany, a complete wire-rolling plant capable of producing wire thicknesses of from 5.5 to 10 mm. Hourly output will vary between 10 and 35 metric tons and rolling speed between 25 and 30 metres per second.

Canadian Coal's Slight Recovery

COAL production in Canada so far this year has risen for the first time in 10 years. The increase amounts to only 6 per cent. and its permanence or otherwise depends to a large degree on the recommendations of a Royal Commission on the industry which is due to deliver its report this month. Despite the odds against the coal industry, which has suffered a rapid decline since the discovery of oil at Leduc 10 years ago, some coal producers are hoping that the commissions' recommendations will bring a new impetus to the industry.

In the past 10 years output from Canadian collieries has fallen from over 19,000,000 tons a year to less than 10,000,000 tons and employment has correspondingly halved to around 12,000. The Government has provided some assistance in the matter of freight rates, the consideration of which has prevented some coal users along the St. Lawrence from converting to oil. The freight subsidy has also enabled producers to retain a footing in the Japanese coking-coal trade.

Pending the commission's report, Dominion Steel & Coal Corporation, Limited, the country's largest producer, has postponed scheduled shut-downs of some of its mines in the Maritime Provinces.

Trees Can Beautify Slag Heaps

"PLACES for peaceful pilgrimage," was the future of the country's slag heaps and industrial tips revealed by Mr. J. Q. Williamson, the director of forestry, Forestry Commission, to the Botany Section of the British Association for the Advancement of Science recently. There was no reason why a number of hardwood species of trees should not grow on coal tips and open-cast mining sites, he said.

It had long been a prejudice that tips should be allowed to "weather" to improve the fertility, but a recent survey had revealed that no failures could be attributed to lack of fertility in the tip. One of the main difficulties, he said, was vandalism.

Fencing should be an integral part of any tip planting scheme. Only when the trees were less vulnerable could the fences be removed and the public pilgrimages begin.

NEW COLLIERY FOR EIRE

NEW colliery to be developed at Barnamceagh, between Ballinamore and Drumshambo (Co. Leitrim), Eire, is expected to begin production next spring. The mine, which is planned to have an eventual output of between 500 and 600 tons of coal a week, is being operated by the newly formed Irish company, Connaught Collieries, Limited.

The mine will be fully mechanized and will produce coal of a semi-bituminous grade. The company hopes to capture some of the home market for industrial coal at present met by imports. About 100 men will be employed in the mine.

OUTPUT this year from the yard of Belfast shipbuilders, Harland & Wolff, Limited, has reached 160,000 tons, the highest figure for 14 years.

Importance of

INTERNAL QUALITY IN WELDING

Internal Flaws, Brittle Fracture, and Fatigue

Internal flaws and their effects on brittle fracture and fatigue are considered in a paper by I. G. Hamilton, B.Sc., of Babcock & Wilcox, Limited, read at the recent symposium on "Internal Steel Quality and Methods of its Assessment" arranged by the West of Scotland Iron and Steel Institute. Stating that variations in the quality of plate material cannot be overlooked, the author makes a plea for greater consistency on the part of the steelmaker. The shortcomings of inspection methods are also mentioned.

ADVENT of fusion welding on a large scale in fabrication is comparatively recent and was given great impetus by the last war. Today welding is not just an alternative method of fabrication, it is often the only method. It is not conceivable that power stations, conventional as well as nuclear, oil refineries, and 100,000-ton tankers could be built without resorting to fusion welding. That this is possible is not chance, but is due to years of development and research within the welding industry.

At the present time it is possible to see in this country, within the pressure vessel industry, companies still riveting vessels while other companies undertake the welding of spherical pressure vessels 70 ft. in dia., made in 3½-in. thick mild-steel plate. Such has been the rate of progress in the welding industry. This rate of progress has not unnaturally been attended by some errors, of which some have gained a prominence far beyond their importance. Unfortunately one always remembers the number of Liberty ships that failed and not the number that were satisfactory.

This paper is solely concerned with the internal flaws: these fall into three distinct categories, namely, porosity and piping; non-metallic inclusions, and cracking.

Porosity

Porosity is associated with two distinct phenomena. Firstly, there is the solution of gases in molten weld metal at high temperature in the welding arc with the consequent precipitation of these gases as the metal solidifies and cools. Secondly, porosity may be due to chemical reaction within the weld metal as it cools, with the formation of a gaseous reaction product which may be entrapped in the solidifying metal.

The sources of gas are threefold, namely, the electrode, specifically the coating, the atmosphere, and the plate itself. The amount of gas evolved by an electrode coating varies with the classification of the electrode. According to Mallett, the arc atmosphere corresponds with the equilibrium $CO + H_2O \rightleftharpoons H_2 + CO_2$. The extremely detrimental effect of hydrogen on weldments has been long established and this has resulted in the development of the low-hydrogen electrode, the coating of which contains increased concentrations of carbonates, which dissociate at the arc temperature producing carbon dioxide and suppress the hydrogen. The purpose of the electrode coating is to establish a shield, both gaseous and liquid, which will prevent atmospheric contamination of the molten weld metal as it transfers across the arc. Oxidation, with the resultant danger of porosity, is also greatly inhibited by the addition of deoxidants to the coating material.

The recent development of metal arc welding using an inert gas such as argon or carbon dioxide as a gaseous shield has been successful in avoiding porosity where adequate gas coverage has been achieved.

Non-metallic Inclusions

The main problem is the entrapment of the fused electrode coating in the molten weld pool. While these inclusions are important, weld metal deposited by the metallic arc, coated electrode technique, will always contain inclusions. Under proper conditions these inclusions should be small, spherical, and discrete, but by improper welding technique and poor coating materials it is possible to produce numerous discrete angular inclusions which can cause trouble in the mechanical tests mandatory in the production of most weldments.

Weld Cracking

Cracks are either termed hot cracks or cold cracks. In the former case they are intergranular and in the latter case, generally transgranular. However, the presence of certain intergranular entrapments or segregations may result in a cold crack being intergranular. Hot cracking appears to be the more common and may be considered as somewhat akin to hot tearing in a casting. Longitudinal weld cracks probably occur more frequently than any other type of crack, especially in the root run of a multi-pass weld. It is generally held that if the root run is crack-free there is every possibility

that the rest of the weld will be crack-free. Transverse cracks occur due to severe longitudinal stress which may, in some instances, be related to the differences in thermal expansion of weld deposit and plate material, giving rise to considerable stresses during cooling subsequent to welding.

Another type of crack, the notch crack, is associated with stress concentrations due to such factors as incomplete root penetration, the junction of the plate material and backing strip, and entrapped slag inclusions. In addition to these macro-cracks, weld metal is prone to micro-fissuring and for ferritic welds this phenomenon is primarily associated with high cooling rates and hydrogen contents of the weld metal.

With regard to weld cracking, the most important factors are:—Welding process and technique; restraint on the joint; chemical composition of the weld metal; design of the joint.

Effects of Internal Flaws in Welded Joints

Of all the modes of failure that are likely to occur the one that has received the most attention is that of brittle fracture and the one that is most likely to occur is failure in fatigue.

It is impossible to consider weld flaws without mentioning brittle fracture. Fortunately, it has now been established that brittle fracture is not exclusively a welding phenomenon and that it was not an uncommon occurrence in riveted structures. In all probability many failures in riveted structures were of a brittle nature, but this fact was not recognized. Due to the discontinuous nature of the riveted structures these failures did not tend to be as serious as those in a continuous welded structure.

The question of brittle fracture became of prime importance during the last war when it was necessary to fabricate merchant ships principally by welding instead of riveting. The failures that occurred have achieved a historic significance and have touched off one of the most heavily documented scientific investigations ever undertaken on an international scale. However, the important factor in all this is that the problem stems from failures in service. The most disconcerting feature is the fact that catastrophic failure can occur at very low levels of applied stress. A study of the ship failures in which the origins of the fractures were established shows clearly that, while defective welding was an important contributory factor, it was by no means the only one.

An examination of some of the major brittle failures in welded structures other than ships is also of considerable interest. During the years 1938 to 1940 serious failures occurred on several bridges over the Albert Canal in Belgium. All these bridges were of the Vierendeel truss design. Probably the most famous bridge disaster was the Duplessis Bridge in Canada in 1951. Final failure in this bridge came after two cracks had been discovered and rectified. An investigation of the flange plates originally found to have failed showed them to be a rimmed quality steel with carbon content variation of 0.23-0.40 per cent. and sulphur content variation of 0.04-0.116 per cent. Charpy notch-bar tests taken from the material gave values of 3, 4, and 6 ft.-lb. at + 100 deg. F. The failure of a spherical hydrogen storage vessel in Schenectady in 1943 was attributed to:—(*a*) Poor design; (*b*) high residual stress at the manhole welds which were cracked; (*c*) notch brittleness of the semi-killed steel at the temperature of failure; (*d*) thermal stressing due to a sudden rise of temperature of 27 deg. F. in 7 hr.

In Britain the most notable failures in non-ship structures occurred at Fawley, 1952, on two large oil storage tanks. In one instance failure originated at a faulty patch weld where an inspection probe had been removed on the first horizontal weld seam. The origin of failure in the second instance was an improperly repaired weld crack.

Several interesting points arise in connection with these failures. Details of climatic conditions were not always available, but the failures all tended to occur at low temperature and while there is evidence that in a large proportion of these failures the origin was a weld defect, the crack or cracks, in general, propagated in the plate materials and not in the weld metal. Moreover, these service failures would tend to indicate that crack-like flaws in welds were of more importance in causing brittle failure than entrapped slag and porosity.

The record of these major failures exposes the complexity of this problem and suggests that to rely solely on perfect welding techniques without paying due regard to proper design and selection of material for the conditions of service intended is both unscientific and unrealistic. The problem of developing a test that would give realistic design answers has exercized people's minds over a considerable period of time.

Three US Reports

In the United States the Ship Structure Committee has produced three reports of considerable value and interest, and in Britain, the work on wide plate tests carried out by Wells and Kennedy has established a very important fact. In a paper of limited length it is impossible to consider this work in any detail, but it is important to establish whether there are any corroborative conclusions that can be drawn from work undertaken from different points of view. The American results indicated that the applied stress necessary to propagate a brittle fracture from a weld crack decreased as the residual or reaction stresses on the weld increased. In fact, the earlier work came, somewhat optimistically, to the conclusion that it was " quite difficult to initiate brittle fracture from cracks less than 4 in. long." The subsequent work proved that brittle fracture could be produced from much smaller cracks and at applied stresses as low as 2,000 lb./sq. in. at temperatures of the order of 0 deg. F. This later work again underlined the important role of residual stress in brittle fracture propagation.

Both Wells and Kennedy have shown experimentally that the removal of residual stress by thermal treatment at 650 deg. C. renders a mild-steel welded joint into a condition where it is necessary to apply loads of yield point magnitude before brittle fracture will propagate from a crack-like flaw. Furthermore, Kennedy underlined the fact that the stress relief need not be by thermal treatment but that similar results could be achieved by plastically deforming the joint. These results are of major importance and indicate a possible method whereby the danger of brittle fracture in welded structures can be greatly reduced.

Failure in Fatigue

It is an unfortunate fact that welding would appear to reduce the fatigue strength of a steel member even in the absence of stress concentrations. This has led to premature fatigue failure in many components that have been repaired by welding, such as the rebuilding of worn shafts, etc. Again the problem is to establish a test from which reliable design data can be obtained. This is, of course, extremely difficult in the case of fatigue, which is a long-term phenomenon.

Recent Russian work by Trufyakov has shown that there is a limiting size of test specimen on which reliable fatigue properties of a welded joint can be ascertained. As the size of the test specimen increases the fatigue strength decreases down to a limiting value and for the determination of fatigue strength of butt joints minimum specimen dimensions of 200 mm. in width by 26 mm. in thickness should be used. To impose further the conditions of typical weld defects in fatigue specimens and gain any chance of reproducible results is an immense task. Recently published work by Newman and Gurney has indicated that for ½- and 1 in.-thick butt-welded plates it is possible to produce fatigue strengths equivalent to that of the unwelded as-rolled plate. The conditions that must be fulfilled are:—(*a*) The weld reinforcement is removed by machining followed by hand polishing, and (*b*) there are no included defects in the weld.

Weck has summarized the general position by stating that cracks and root defects are the only welding defects that will produce severe reductions in fatigue strength. Before leaving the question of fatigue it may not be without point to refer again to the work of Trufyakov, where he indicates that residual stress greatly affects the fatigue strength of butt-welded joints and that significant improvements can be achieved by stress relief. Unfortunately, this is not substantiated by the work of Newman and Gurney. Their results have been such as to indicate that stress relief does not have any influence on fatigue strength.

There is little point in the fabricator taking every precaution with welding technique if the material supplied is virtually unweldable. This has meant that the fabricator of quality structures has been forced to involve himself in expensive plate examination techniques merely to ensure that the plate material is of acceptable welding quality. The problem is not nearly so serious with thinner as with thicker plate. However, with thinner plate there has been considerable trouble with porosity. In some instances this has been associated with ferrite banding in plates. In a banded steel, it appeared that the non-metallic inclusions were preferentially associated with ferrite bands. On welding, these inclusions formed nuclei for gas precipitation and the resultant welded joint contained a continuous line of gas pores at the plate/weld junction. This was greatly improved by addition of aluminium to the steel, presumably by the formation of more stable oxide inclusions that were not centres of gas precipitation. With thicker plates the problem of segregation becomes of major importance, especially with the higher tensile steels, containing greater concentrations of carbon and alloying elements.

Work of the British Welding Research Association on the weldability of high-tensile steels concludes that, for good mechanical properties and ease of weldability, moderate additions of several alloying elements are preferable to a large addition of a single alloying element. The practical effect of the severe segregations is the production of heat-affected zone cracks, as the greater the hardenability of the material the greater is its tendency to crack. This cracking is affected by:—(1) The chemical composition and heterogeneity of the plate material; (2) the cooling rate, especially below 400 deg. C.; (3) the restraint on the joint; (4) the hydrogen content of the weld metal.

The last three factors are the responsibility of the fabricator, but it should not be too much to ask that the steelmaker supply material of reasonably uniform hardenability.

Inspection of Welds

The only acceptable methods of determining the presence of flaws internally are radiographic and sonic. The former is the older and more established method. However, as the thickness of the weld joint increases, the ability of X-rays or gamma-rays to differentiate flaws decreases. As the standard of radiographic acceptance in the United Kingdom on Class I work is normally based on a penetrameter sensitivity of 2 per cent., the size of flaw that may be missed, by implication, in a 5-in. thick seam is 0.10 in. However, the problem is even more complex than this as it has long been acknowledged that radiographic methods are not well suited to the detection of fine cracks. In a recent paper Halmshaw refers to a formula derived to determine the minimum depth of crack that can be detected with a given radiographic technique. From application of this formula and experimental checks it has become obvious that a set of completely clear radiographs from a welded seam are not a guarantee that the weld is crack-free. It has to be accepted that as yet it is not possible to correlate the mechanical properties of a joint with the appearance of the weld radiograph.

To facilitate matters the International Institute of Welding (IIW) has prepared a collection of

Reference Radiographs of Welds that are useful in training inspectors and radiographers and has just embarked on a programme whereby it is hoped to produce acceptance criteria (1) for the quality of radiographic image in the case of pressure vessels and boilers and (2) for the quality of welds in pressure vessels and boilers.

The application of ultrasonic methods to weld examination is attractive. The speed and economy of the examination method are obvious. Unfortunately, until recently it has not been possible to produce a record of the examination. Moreover, the standardization of inspection methods poses many more problems than for radiographic examination. As yet the "penetrameter" of ultrasonic examination is not available. However, as welded joints increase in thickness and as the necessity for inspecting welds that are not amenable to inspection by radiographic methods becomes more critical, the only solution that appears to be feasible is to develop accepted ultrasonic techniques.

Conclusions

Only the most tentative conclusions can be drawn with respect to the effects of weld flaws on the service performance of a welded joint. With welded joints that are liable to high fatigue stresses it is essential that, where design will not permit the weld being moved from a zone of high stress, the joint should be carefully designed to obviate any stress concentrations, and welding must be of the highest quality. Where possible the joint should be designed so that it can be tested by non-destructive methods.

Where brittle fracture is a possibility the design must be carefully considered, the material must be correctly selected and welding procedure and technique must be of the highest quality. If possible the joint should be stress-relieved as an additional safeguard. With large structures this may not be practicable and great care should be taken before the application of any local stress-relieving treatment is carried out. Improper stress-relieving treatment may induce more stress than it removes. Under these conditions the use of peening as a method of relieving stress may well be a possible solution.

As the thickness of the plate being welded increases it becomes more essential for the steelmaker to improve the quality of his product. Any measures taken which result in cleaner and more homogeneous plate material will be of immense value to the fabricator.

Finally, the fact that non-destructive testing as at present applied will not necessarily guarantee that a weld is free of significant faults requires the fabricator to develop welding techniques that are not prone to defects and to maintain these techniques in production under close and constant supervision.

Correspondence

WATERWAYS NEGLECT

To the Editor of IRON AND COAL

SIR,—"A realistic view is being taken of the situation," states the official spokesman, as reported in your issue of September 2. No one accustomed to the ways of at least the British Transport Commission will be surprised to discover that the transaction in question is a substantial transfer of traffic from rail or water to road.

"Realistic" is the epithet regularly applied to this operation. But is it realistic? In the present state of the railways, we suggest that for a single ton of coal to be switched deliberately to the highway, is, on the contrary, sheer fantasy; and it is at least equally fantastic that the waterway is not mentioned at all. For there is a perfect maze of nationalized navigations in the area understood to be concerned, and most of them were built primarily for the carriage of this very cargo, coal.

Is it realistic to suppose that there is not something very seriously wrong with the Commission when such things can happen?—Yours very truly,

ROBERT AICKMAN,
Founder and vice-president.

Inland Waterways Association,
Limited,
11, Gower Street,
London, W.C.1.
September 12, 1960.

HOT-TOPPING PRACTICE AT COLVILLES

To the Editor of IRON AND COAL

SIR,—May I be permitted to correct an erroneous impression which may be gained from reading Mr. T. Harris's paper (p. 563, September 9), in which he says that the present method of hot-topping at Dalzell Works "followed a long series of experiments involving 'C & D' hot tops . . . and other types."

This would imply that the "C & D" hot top had been tried experimentally and had failed to achieve results equal to or better than those obtained by other methods, whereas in actual fact the "C & D" hot tops were not even tried at Dalzell during recent years. From 1954 to 1957 various "C & D" designs were indeed submitted to Colvilles, but nothing in the nature of experiment or trial was carried out. It may be said that in earlier years "C & D" hot tops had been used at Dalzell, before the writer's company became associated with the process, but it will be borne out by current users, I am sure, that present "C & D" practice in this country shows a very considerable improvement over previous efforts. Any assessment of results, therefore, should be based on up-to-date findings.—Yours faithfully,

H. WOOLFSON.

London & Scandinavian Metallurgical
Company, Limited, Sheffield.
September 9, 1960.

Foam Injection in Ripping Lips

FOURTH REPORT ON SHOTFIRING IN YORKSHIRE

In the fourth report on shotfiring in Yorkshire by the North-Eastern Divisional Shotfiring Committee, presented to the Yorkshire Branch of the National Association of Colliery Managers on April 12, 1960, by Mr. A. Haines, explosives engineer, Area No. 5, and Mr. K. Howard, assistant divisional explosives engineer, North-Eastern Divisional Coal Board, a method is described of injecting shotholes with a foam solution to minimize the risk of firedamp ignitions.

THE third report* of the North-Eastern Divisional Shotfiring Committee presented in 1955 described the hazard constituted by the presence of breaks in shotholes in ripping lips. The suggestion was made that foam injected into such shotholes would reduce the hazard of ignitions of methane by explosives, and tests carried out by the Safety in Mines Research Establishment indicated that "Foam in equal weight (but much greater volume) was rather more effective in preventing ignition than a sodium bicarbonate sheath."

This report describes the development of equipment suitable for making foam and injecting it into shotholes. An account is given of further tests by the SMRE of the effectiveness of the foam in reducing the ignition hazard.

Early Developments

The first foam unit consisted of a 2-gal. fire extinguisher fitted with a spray gun and air necessary for the production and injection of foam was obtained by connecting the unit to the compressed-air mains. A 3 per cent. solution of Pyrene standard foam compound was sufficient to provide foam of satisfactory consistency and the foam was contained inside the shothole by means of a sealing gland fitted to an extended nozzle connected to the spray gun. Brass eyelets in the nozzle served to agitate the mixture forced from the cylinder and to assist in its transformation into foam.

Experiments with this equipment were not very successful as difficulty was experienced in holding the gun in the shothole during injection. As the equipment was dependent on the mains for its supply of compressed air and these, not being always available, an attempt was made to design a foam unit whose operation was not dependent on the mains.

Drilling machines are available on most faces and consideration was therefore given to the use of such equipment to provide the necessary power. Accordingly, a small compressor similar to the one used for inflating pneumatic tyres was mounted with the 2-gal. cylinder on a small base plate and provision was made for its connection to a drilling machine. By this means, sufficient air pressure was generated to inject foam into shotholes. Although the device appeared to be attractive, the use of a drilling machine for purposes other than that for which it had been designed was considered undesirable so it was not used underground.

A manufacturing firm was then approached and invited to design a unit incorporating an electric motor. The equipment they finally developed comprised a 1-h.p. motor coupled to a small compressor which produced air at 25 to 30 lb./sq. in., and pressurized a container holding a 3 per cent. solution of Pyrene foam compound. The injection gun used with earlier equipment was adapted for use with this unit, but it was fitted with an improved sealing gland which effected a more efficient seal. The equipment is illustrated in Fig. 1.

Underground Trials

Trials were carried out at Wentworth Silkstone Colliery in the right-hand gate ripping, No. 3s district, Whinmoor Seam. The gate road was supported on 11-ft. by 8-ft. arched girders. The ripping consisted of fairly hard bind with ironstone intrusions and clearly defined bedding planes. Shots were fired in rounds using sheathed Driftex explosive and milli-second delay detonators with a maximum overall delay period of 75 milliseconds; the disposition of the shotholes was as shown in Fig. 2. A Sullivan slusher packing machine was used for the disposal of ripping dirt into the waste.

The normal system at Wentworth Silkstone Col-

* Transactions, Inst. Min. Eng., Vol. 115, p. 893.

MEMBERSHIP OF THE COMMITTEE

Membership of the North-Eastern Divisional Shotfiring Committee is as follows:—

Mr. J. E. Longden (chairman), Mr. A. Wright, Mr. F. S. Steele, and Mr. K. Howard (investigator), all representing the NCB; Mr. H. J. Perrins, HM Divisional Inspector of Mines; Mr. H. H. Burton and Prof. J. T. Whetton, of the Midland Institute of Mining Engineers, and Dr. E. M. Guenault and Dr. H. C. Grimshaw, of the Safety in Mines Research Establishment.

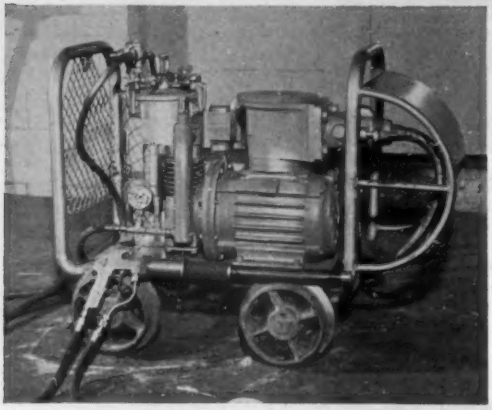

FIG. 1.—ELECTRICALLY DRIVEN COMPRESSOR UNIT FOR INJECTING SHOTHOLES WITH FOAM.

liery is to blast the ripping up to the coal head so that the maximum depth of ripping at any time is 5 ft. Even with this short web, breaks develop in the shotholes after cutting and these are frequently not detectable by a break detector. That these very fine breaks do exist is shown by the emission of foam from various points at the face of the ripping during injection. At collieries where it is the practice to leave a web of ripping back from the face there will be a greater tendency for breaks to develop and these may communicate with reservoirs of gas in remote places where examination by normal means is not possible.

There was some indication during the trials that foam injected into the ripping travelled some distance from the shotholes, but it was not possible without interruption of the normal cycle of operations to trace the foam over the packholes to assess how far it extended.

Early in the trials a plug of stemming was inserted to the back of the shothole as required by Regulation, before foam injection, but it was thought that this might prevent the passage of foam through breaks where they are suspected of occurring most frequently. A trial was therefore, carried out in which the plug of stemming was inserted after foam injection and it was found that more foam was used when the injection was carried out before inserting the plug of stemming. This suggested that breaks can develop at the back of shotholes and confirmed the need for a plug of stemming to be used as required by Regulation. The insertion of the plug after injection was adopted as standard practice.

Tests were made to assess how long the foam injected into a ripping appeared to retain its consistency. Visual inspection only was possible, but on this basis it appeared to be consistent for several hours. These observations were subsequently confirmed by the SMRE tests when foam that had been injected into an artificial break two to three hours before a charge was fired was still capable of greatly reducing the chance of ignition of a 9 per cent. methane/air mixture. It would appear therefore, that if foam is injected into a ripping within two hours of the shots being fired it will give protection against an ignition of gas. It should be noted, however, that after injection, further strata movement could result in the widening of existing breaks or bed separations, or the formation of new ones, which, of course, would not contain foam. It is advisable, therefore, to inject foam as short a time before the shots are fired as practicable.

No difficulties were experienced in inserting the explosive cartridges when charging the shotholes. The $1\frac{7}{8}$-in. dia. cartridges did in fact seem to enter the $1\frac{1}{4}$-in. dia. shotholes more easily after foam injection than when the holes were dry. In order to prevent, as far as possible, foam getting between the cartridges and causing a possible interruption of the detonating wave between them, the complete charge was inserted into the shothole as a train in order to ensure that all the cartridges were in contact with each other. During foam injection trials no undetonated explosive has been found and no miss-fires have occurred.

Effect of Foam Injection on Airborne Dust

An interesting feature of the trials was the reduction in the amount of dust and fumes produced by shotfiring after foam injection. The men were very appreciative of this, although their exposure to them was only of short duration. In order to assess the concentration of airborne dust during the half to three quarters of an hour spanning shotfiring operations, samples were taken by a thermal precipitator; the results are shown in Table 1. The sampling point was situated some 80 yd. from the ripping lip in the return gate along which approximately 6,000 cu. ft./min. of air was passing.

There was thus a reduction of about 50 per cent. in the quantity of airborne dust with foam injected shots compared with that produced when holes had not been injected. Some of this reduc-

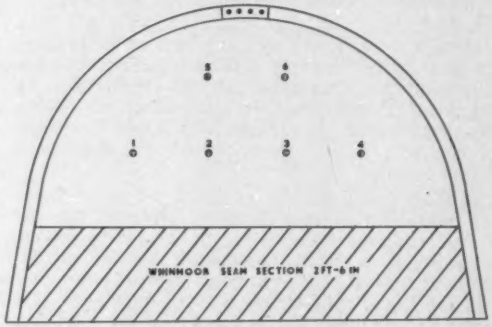

FIG. 2.—DISPOSITION OF SHOTHOLES FOR FOAM INJECTION AND BLASTING AT A RIP IN THE WHINMOOR SEAM, WENTWORTH SILKSTONE COLLIERY.

TABLE 1.—*Airborne Dust Samples Taken with a Thermal Precipitator.*

Date.	With foam injection. Particles per c.c. 0.5–5 microns.	Date.	Without foam injection. Particles per c.c. 0.5–5 microns.
15.4.58	3,328	—	—
17.4.58	3,500	—	—
18.4.58	4,070	—	—
22.4.58	4,416	16.4.58	11,849
24.4.58	7,058	23.4.58	9,682
25.4.58	4,990	30.4.58	8,926
29.4.58	4,617	5.5.58	6,260
2.5.58	4,200	6.5.58	4,488
Average ..	4,522	Average	8,241

tion would be brought about by foam penetrating bedding planes and breaks in the strata and so suppressing the dust in them. It is unlikely that foam injection has much effect on the dust produced by fragmentation of the strata.

A series of tests extending throughout the whole of the 24 hr. each day and continuing for a period of four days was carried out primarily to determine the effect of foam injection on the movement of firedamp into shotholes in the ripping. Approximately 500 bottle samples were taken, those from the shotholes being obtained by means of a small bore brass tube 6 ft. in length connected to a small exhaust pump. The methane percentages determined in samples taken from ripping shotholes are shown in Tables 2 and 3. The average methane concentrations in the general body 10 yd. from the face were as follow:—During cutting operations, 0.25 per cent.; during filling, 0.15 per cent.; during packing and withdrawal, 0.10 per cent.

A further test was then carried out to cover the whole cycle of operations in which samples were taken at half-hour intervals from shothole No. 2. The cycle of operations at the face was:—Nightshift, ripping when the lip was advanced to the coal; dayshift, cutting; afternoon shift, filling, with shotfiring. On the day of the test, the ripping shotholes were bored dry using an electric rotary drill between 6.30 and 7 a.m., the ripping face being flush with the solid coal. Samples were drawn through the 6-ft. brass tube and collected in 2-oz. (60-c.c.) glass sample bottles. The four shotholes in the lower row were injected with foam between 4.30 and 4.45 p.m., and the foam then cleared from the test borehole by inserting and removing a stemming stick. The results are given in Table 4.

The results show that there was a considerable amount of methane in the test hole during the first half hour after boring. The methane content then decreased gradually and then remained steady for several hours after which undercutting of the seam caused the concentration to rise again. Following injection, the methane content fell to a value lower than any previously measured and remained at this lower level. It would, therefore, appear that the foam injected was effective in preventing the migration of methane into the test hole.

All the tests made during the full period of the investigation show that foam does act as a barrier between reservoirs of methane and ripping shotholes. The sealing of the communicating breaks

TABLE 2.—*Samples Taken from Shotholes Bored and Injected Immediately Before Firing.*

Date.	Before injection. Shothole.	Methane.	After injection. Shothole.	Methane.
		Per cent.		Per cent.
19.5.58 ..	No. 1	9.65	No. 1	0.50
	No. 2	5.08	No. 2	0.60
	No. 3	3.70	No. 3	0.30
	No. 4	2.00	No. 4	0.50
	No. 5	1.20	No. 5	0.60
	No. 6	0.80	No. 6	0.25
20.5.58 ..	No. 1	3.10	No. 1	0.20
	No. 2	3.20	No. 2	0.50
	No. 3	5.00	No. 3	0.50
	No. 4	5.75	No. 4	0.15
	No. 5	0.80	No. 5	0.20
	No. 6	0.70	No. 6	0.10
22.5.58 ..	No. 1	2.70	No. 1	0.60
	No. 2	0.70	No. 2	0.25
	No. 3	4.10	No. 3	0.15
	No. 4	5.50	No. 4	0.10
	No. 5	0.40	No. 5	0.10
	No. 6	0.20	No. 6	0.05

TABLE 3.—*Samples Taken Immediately Before and After Injection from Shotholes Bored 16 hr. Before Injection.*

Date.	Before injection. Shothole.	Methane.	After injection. Shothole.	Methane.
		Per cent.		Per cent.
21.5.58 ..	No. 1	0.90	No. 1	0.05
	No. 2	5.00	No. 2	0.60
	No. 3	5.00	No. 3	0.10
	No. 4	7.00	No. 4	0.20
	No. 5	4.90	No. 5	0.65
	No. 6	4.10	No. 6	0.10

TABLE 4.—*Test of Methane Migration into Shotholes.*

Time.	Sample No.	Methane.	Remarks.
		Per cent.	
7.10 a.m. ..	1	3.80	—
7.40 a.m. ..	2	4.00	—
8.10 a.m. ..	3	1.80	—
8.40 a.m. ..	4	1.00	—
9.10 a.m. ..	5	1.20	—
9.40 a.m. ..	6	1.20	—
10.10 a.m. ..	7	1.15	—
10.40 a.m. ..	8	0.90	—
11.10 a.m. ..	9	1.00	—
11.40 a.m. ..	10	0.80	—
12.10 p.m. ..	11	0.80	—
12.40 p.m. ..	12	1.00	—
1.10 p.m. ..	13	1.10	—
1.15 p.m. ..	—	—	Cutting under test hole
1.40 p.m. ..	14	0.90	—
2.10 p.m. ..	15	0.90	—
2.40 p.m. ..	16	2.50	—
3.10 p.m. ..	17	0.90	—
3.40 p.m. ..	18	2.15	—
4.10 p.m. ..	19	1.35	—
4.30 to 4.45 p.m. ..	—	—	Injection of lower four boreholes
4.40 p.m. ..	20	0.70	—
4.55 p.m. ..	—	—	First shot in coal under ripping lip
5.10 p.m. ..	21	1.20	—
5.20 p.m. ..	—	—	Second shot in coal under ripping lip
5.40 p.m. ..	22	0.50	—
6.10 p.m. ..	23	0.50	—
6.40 p.m. ..	24	0.40	—
7.10 p.m. ..	25	0.50	—
7.40 p.m. ..	26	0.50	—
8.10 p.m. ..	27	0.30	—
8.40 p.m. ..	28	0.30	—
9.10 p.m. ..	29	0.60	—
9.40 p.m. ..	30	0.35	—
10.10 p.m. ..	31	0.50	—

FIG. 3.—FIRST DEVELOPMENT OF THE HAND-OPERATED FOAM INJECTOR.

between shotholes or between a shothole and a reservoir must reduce the risk of gas being ignited during shotfiring operations in ripping lips.

Further Developments and Trials

Although the foam unit used in the underground trials described above was very satisfactory in operation, it suffered from a number of disadvantages. Probably the most important of these was that it required a supply of electrical power to be readily available and, as many face supply gates are not so equipped, the foam unit could not be used at those rippings where it would be of the greatest value. In addition, the equipment was expensive and its limited mobility would necessitate a separate unit for each gate.

Water under pressure was then considered as an alternative form of power and the possibility of using the water foam technique of some firefighting equipment was considered. After some investigation, a small unit which produced foam when supplied with water at a pressure of about 150 lb./sq. in. was tried underground. The trials were, however, unsuccessful, mainly due to fluctuations in water pressure. Also, the rate of foam production was far in excess of the modest rate required to inject ripping shotholes.

A new approach was then made to the problem and early in 1959 a new type of foam injector, operated by hand, was devised at Area No. 5 Central Workshops, North-Eastern Divisional Coal Board. This unit, shown in Fig. 3, comprised an ordinary 2-gal. fire extinguisher and small hand pump connected by a rubber tube and containing a non-return valve.

Although improvized, the device gave most encouraging results underground and led to one of improved design being made. The fire extinguisher was replaced by a cylinder 13 in. high and 6 in. internal dia., fitted with a flat lid. An air filter was attached to the top of the hand pump as it was anticipated that the piston and cylinder walls would quickly be affected by dust drawn into the pump. The injection gun was also redesigned, the sealing rubber being expanded by the action of a new type of linkage. The equipment is shown in Fig. 4 and it will be appreciated that at this stage of design the foam injector could only be moved with ease by two men.

A few modifications were made to the apparatus described, which was then submitted to a manufacturer as the prototype for commercial production. The production unit included several improvements, the most important of which was the positioning of the hand pump at the centre of the cylinder. In addition, a new injection gun of the type manufactured for pulsed-infusion shotfiring was provided. Details of this equipment are shown in Fig. 5. The new position of the hand pump enabled a considerable reduction to be made in the size of the base plate, thus permitting one man to carry the equipment. A strip of welding 3 in. above the base of the cylinder denotes the level to which the Pyrene foam compound should reach in order to make a 20 per cent. solution when the remainder of the cylinder is filled with water. This foam solution, of greater strength than had been used in the previous foam units, was found to be necessary because the supply of compressed air was from a single acting hand-operated pump.

Several trials were carried out with the new equipment in a ripping at Wentworth Silkstone Colliery and considerable success was achieved. It was apparent that foam was forced through breaks in shotholes which it was not possible to detect with

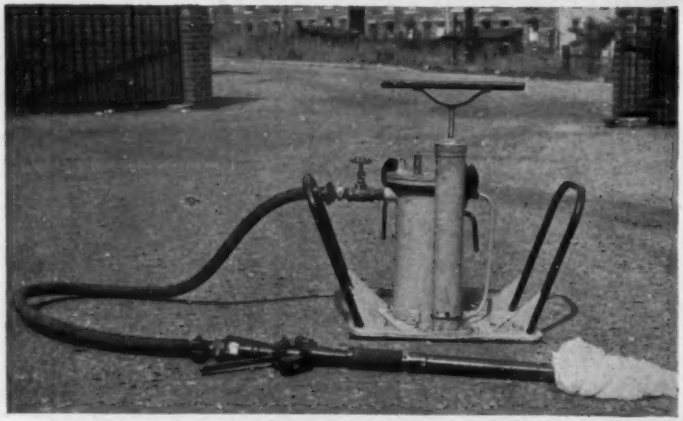

FIG. 4.—IMPROVED DESIGN OF CYLINDER AND INFUSION GUN.

the break detector. Frequently foam emerged at the face of the ripping some distance from the mouth of the shothole being injected and on occasions travelled through the strata to an adjacent shothole. The appearance of the ripping face after foam injection is illustrated in Fig. 6.

Tests Made by SMRE

The encouraging results of the tests carried out by the Safety in Mines Research Establishment at Buxton, supported by the visual evidence obtained underground of the penetration of the foam into the most narrow of breaks, suggest that the technique will considerably reduce the risk of igniting methane by ripping shots. It is proposed to extend the technique to several collieries in Area No. 5 of the North-Eastern Division, and it is hoped that it may be quickly introduced in other parts of the coalfields.

Results of tests made by the SMRE to determine the effectiveness of foam produced by the prototype manually operated foam unit in preventing the ignition of a methane/air mixture by explosives are as foilow:—

"In these tests, two flat-steel plates, 3-ft. square, were fixed horizontally 1 in. apart, to simulate a break or parting. This assembly was installed in a gas chamber and both the chamber and the break could be filled with a methane/air mixture containing 9 ± 0.25 per cent. methane. The explosive charge to be fired was placed between the plates at the centre of the break, and arrangements were provided for the foam to be injected to fill the break in the shape of circular patches of various diameters with the explosive charge at the centre.

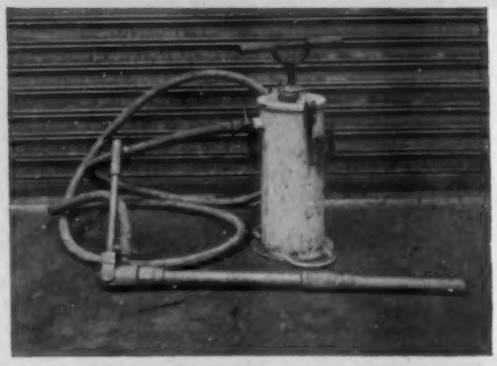

FIG. 5.—FURTHER DEVELOPMENT SHOWING THE PUMP UNIT INCORPORATED WITHIN THE CYLINDER AND NEW TYPE OF INFUSION GUN.

The break was open at all sides, apart from 3-in. dia. securing bolts at the corners. This condition of test simulates the firing of a charge co-axial with a parting; it is probably of greater severity than the more usual condition where a break crosses the axis of a shothole.

"The charges fired were of Polar Ammon gelignite, a non-permitted explosive. This non-permitted explosive was used for the tests because even a small charge fired alone in the break would ignite the methane/air mixture and would therefore provide a very severe test of the effectiveness of the foam.

"The foam tested was produced by the NCB generator containing a 15 per cent. solution of Pyrene standard foam compound in water. The working pressure for the generator was provided by a single-action hand pump and was governed by a spring-loaded release valve. In each test the foam was allowed to stand in the break such as described for a time before the charge was fired.

"The results obtained were as shown in Table 5.

"Earlier preliminary tests had been made with foam produced from only a 5 per cent. solution of Pyrene foam compound, but in which the charges were fired within 15-20 min. of the injection of the foam. While showing a considerable reduction in ignition risk, the effect was not quite so marked as in the present tests. The results given indicate that foam of the consistency used in the present tests, when present in a break, can produce a very significant reduc-

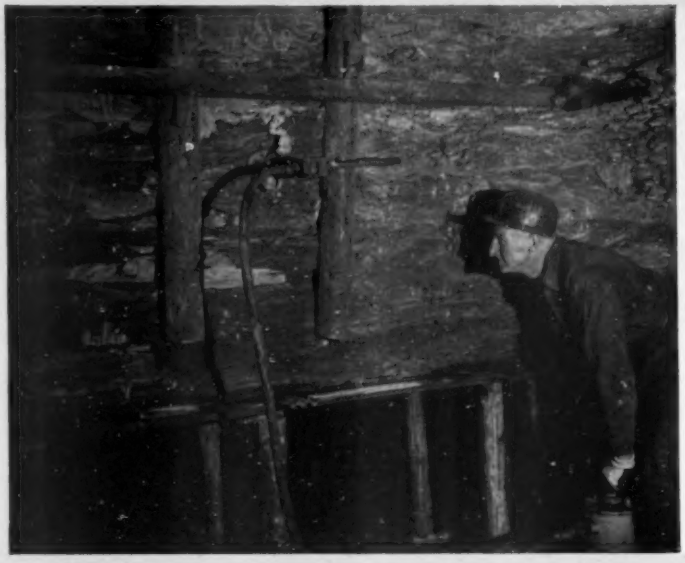

FIG. 6.—APPEARANCE OF RIPPING LIP AFTER INJECTION.

TABLE 5.—*Results of Tests on Foam Unit.*

Weight of charge.	Radius of foam round the charge.	Standing time of foam.	No. of tests.	No. of ignitions.
Oz.	In.	Hr.		
2	Without foam	—	5	5
2	12	½	1	0
2	6	½	5	0
2	6	2	5	0
3	6	½	1	0
3	6	3	1	0

tion in the risk of ignition, even after the foam has been standing for 2 hr."

Acknowledgments

The North-Eastern Divisional Shotfiring Committee wishes to thank the National Coal Board for permission to publish this report. It also expresses its appreciation of the help given by the Safety in Mines Research Establishment and to the Ministry of Power for permission to publish the results of the tests on the foam unit. The thanks of the committee are also extended to the management of Wentworth Silkstone Colliery for its help in the underground trials and to Mr. R. V. Hawks, Central Workshops Manager, Area No. 5, for his help in the development of the equipment.

DISCUSSION

MR. E. BRAMMER, seconding the vote of thanks to Mr. A. Haines and Mr. K. Howard, asked what pressure was developed to inject the foam and what was the cost of making the foam. It was stated on page 3: "In order to prevent, as far as possible, foam getting between the cartridges and causing a possible interruption of the detonating wave between them, the complete charge was inserted into the shothole as a train in order to ensure that all the cartridges were in contact with each other." He also asked what was the position of the detonator when the holes were being charged after the injection of the foam solution.

Replying, MR. HAINES and MR. HOWARD said the pressure developed by the injection unit was approximately 20 lb./sq. in. No test had been made to determine the cost of making the foam, but from the amount used for the 20 per cent. solution, it was very small. The cost of the entire unit was in the region of £30. Since delay-action detonators were used to fire the round, the position of the detonator was as for inverse initiation.

MR. J. E. LONGDEN said Mr. R. E. Greenham, who was present at the meeting, was the originator of the use of foam in ripping shotholes. After a long period of research by the Shotfiring Committee, the idea had been brought to a successful conclusion and was considered to be a great advance in safety when firing shots in rippings.

MR. H. P. A. JOHNSON asked if there was any lubricating effect with the foam when inserting the cartridges and if so, was more or better quality stemming required with this system. He also asked, in cases where foam was injected and the holes were left for a period of time, whether moisture had any detrimental effect upon the strata, causing breaks in the hole to open up still further. Mr. Johnson further asked if foam infusion was recommended where methane drainage was successfully practised.

It was to be expected, replied MR. HAINES, that foam injected into shotholes had a lubricating effect, but it was difficult to decide what amount of stemming was required. As far as they were concerned no departure from the existing practice had been made and no difficulties had been experienced. It should be noted, however, that the quantity of water present was comparatively small. During the short period between injecting and firing the ripping, no detrimental effect upon the strata had been noticed during the trials. Recent investigations made on behalf of the committee indicated that shotholes in rippings in roadways in which methane drainage was practised frequently contained less methane than when foam injection was not in use. However, the effect of drainage might be to reduce the concentration of methane from a high figure to one lying in the explosive range. In such cases, therefore, foam injection of ripping shotholes would definitely be beneficial.

Dust Suppression

MR. C. F. PALMER asked for the volume of foam which was used in any particular hole. In the report, it had been contended that the reduction in dust produced by shotfiring where foam had been injected amounting to about 45 per cent. of normal methods was mainly confined to the dust along strata breaks or bedding planes and not to that produced by fragmentation during blasting. If this assumption was correct it would appear that generally about 50 per cent. of dust normally produced during blasting was already lying in these breaks and bedding planes and that blasting merely projected this into the atmosphere.

Mr. Palmer asked for the assumption on which this information was based. One would have thought, he said, that the foam itself would, on fragmentation, have become available for suppressing much of the dust as it was produced and projected through the distributed foam. The foam could also be expected to absorb noxious gases produced from the explosive charge. It had also been pointed out that there was a reduction in the amount fumes produced by shotfiring. Presumably some of the fumes were absorbed by the foam. He asked if it was reasonable to assume that fragmentation dust would be similarly absorbed.

MR. HOWARD, in reply, said it was difficult to assess the amount of foam which was injected into a shothole as this varied with the number of breaks which existed in the hole. The volume of a 5-ft. shothole was approximately 140 cu. in. and about 10 strokes of the hand pump were required to produce this quantity. Holes containing breaks would naturally require more than this quantity. Sufficient foam was produced from one filling of the cylinder to inject adequately one complete ripping.

With reference to the question on dust suppression, opinions were based on the results of the tests which had been carried out. Although these were limited in number, they definitely indicated that foam injection caused a reduction in the quantity of airborne dust produced by shotfiring.

The total quantity of water contained in the foam injected into the ripping was not large, and is unlikely to have any appreciable effect on the dust produced by fragmentation. With regard to the fumes produced by shotfiring, at the time of detonation the explosives cartridges were completely surrounded by foam and it was not unreasonable therefore to assume that a large proportion of the fumes was absorbed.

MR. R. E. GREENHAM said he was most impressed with the gas-analysis figures and also the SMRE tests, which indicated a very considerable increase in the safety of shotfiring with this technique from an ignition point of view. He was surprised with the degree of

dust suppression achieved and supported Mr. Howard's interpretation of the part played by the foam in this respect.

The job now was to get this apparatus into the pits and, moreover, to get it accepted and used. Mr. Greenham asked if at some future date some relaxation of the regulations might be possible. The exemption, for instance, from the use of the break finder would go a long way to reconcile the shotfirers and operators to carrying out what was otherwise an additional operation.

He was told that it was not intended to apply for any relaxations of the Explosives Regulations; shotfiring would be carried out as laid down.

MR. H. J. PERRINS said much had been accomplished, but this new development by no means eliminated the gas ignition hazard by shotfiring in rippings. Previous reports by the committee dealt with its investigation into the hazards of ignition of gas from ripping shots and for which this division had rather a bad record. As recently as about 18 months ago, for instance, a hanging flame of some hours' duration eventually ignited gas due to a temporary derangement of the ventilation and five separate explosions took place. Fortunately, no one was injured. This particular hazard had been recognized for many years and much had been done to combat it. The liability for breaks to contain gas leading to reservoirs was early recognized and led to the testing for breaks becoming a requirement in the process of the firing of all shots, also the testing for gas in the vicinity and in the mouth of each shothole and the insertion of a plug of stemming into the back of the shothole. However, with these and other safeguards, the hazard had not been eliminated as was shown by the case quoted; but this new development by the Shotfiring Committee was another step forward in the desire for greater safety.

Great Possibilities

It took a new line altogether and, as had been shown, had great possibilities. The fact that the shotfirer carried out most conscientiously the present requirements, gave no guarantee that gas would not be ignited in a break because there was so much he did not know, and could not possibly know, about the conditions which he could not see. But with the addition of this new technique the risk of ignition was reduced and it was important therefore that the new development be regarded as a process which was supplementary to existing requirements and not one made as a substitute for some existing requirements.

It would be observed in reading the paper that all the experiments were carried out in a ripping which was maintained up to the coal face. Mr. Perrins suggested, therefore, that where rippings were held back from the coal face, the liability of there being more and possibly wider breaks present was much greater and would consequently require a proportionate increase in the amount of foam. This aspect was still to be investigated and as the latter type of ripping was the more common and the more hazardous, there was still a lot of work to be carried out before the technique could be regarded as having a universal application.

This development, therefore, was in its early rather than its later stages. The fact that Mr. Longden proposed to introduce the technique fairly extensively into the pits under his control shows that it already enjoyed a certain amount of confidence.

MR. C. N. RATCLIFFE, commenting on the ease of stemming the shotholes, asked if any incidents of blown-out shots had been noted. He also asked if foam injection would prevent or reduce the migration of gas into the roadway from the roadside-pack area.

MR. HAINES and MR. HOWARD said shots were stemmed in the normal manner using sand-clay stemming. There had been no incidents of blown-out shots. While foam injection successfully minimized the migration of firedamp into shotholes, it would be far more difficult to prevent the migration of firedamp into a roadway through the many breaks existing in the strata in the vicinity of the roadhead. It should be remembered that the foam retained its consistency for a limited period only, after which it was not effective as a barrier against the movement of firedamp.

At the request of MR. J. E. LONGDEN, MR. HAINES and MR. HOWARD said it had been decided that the apparatus would be used by a person other than the shotfirer. The shotfirers would have to make sure that the shothole had been injected with foam before the hole was charged. The person appointed to inject foam into shotholes would receive special training in the application of this technique.

Dust Explosions

A REVIEW in 1951 of the methods used to determine the inflammability of industrial dusts showed the results in many cases to be inconclusive. In particular, failure to ignite in a test did not necessarily denote non-inflammability. Since the relative orders of inflammability were different in the two principal methods of testing, it was not clear what combustion properties of the dusts were being examined. The results were dependent on the experimental conditions of operation.

In SMRE Research Report No. 188, "Dust Explosions in Factories: Ignition Testing and Design of a New Inflammator," by Dr. R. H. Essenhigh, a new inflammator is described in which the results are less critically dependent on the operating conditions. It consists of a vertical glass tube 26 in. long and of 3 in. dia. An air blast is used to disperse the dust and form a cloud near the top of the tube, and the cloud then falls under gravity past the igniting source, a hot coil, situated near the bottom.

The report is published by the Safety in Mines Research Establishment, Sheffield, and published by the Ministry of Power (2s. 3d.).

Record Number of British Standards

THE 1959-1960 report of the British Standards Institution, to be presented at the annual general meeting on September 28, shows that 297 new or revised British Standards were published—a record number.

Reviewing features of the year's technical work, the report picks out for special mention the publication of a glossary of terms for work study (BS 3138), of which over 10,000 copies have been sold, completion of the first part of a "Master Schedule of Wrought Steels" (BS3141, dealing with carbon steels), the combination of BS449 and CP113 for the use of structural steel in buildings, the first of a series of standards for data-processing, and an improved standard for chromium plating with an associated labelling scheme.

THE IMPORTANCE OF CARBON DEPOSITS

Discussion on NACM Conference Paper

The marked changes, both in pattern and extent, which had been shown throughout the world in the utilization of the various sources of carbon over the past few years were likely to continue, perhaps at reduced rates, said Mr. H. E. Collins, the National Coal Board's member for production, in the paper which he presented at the 1960 annual conference of the National Association of Colliery Managers. The author emphasized that the British coal industry would continue to be faced with intensive competition. A report of the discussion on the paper (published in our July 15 issue, p. 125) is given below.

MR. G. W. SANDERS (president of the Lancashire Branch of the NACM) said that Mr. Collins had always taken an optimistic view of the long-term prospects of the coal industry of this country and had continually urged that the present trough, although difficult, was not a Slough of Despond, and that the industry would pull through to better times. He had supported that view many times and in many places by carefully reasoned argument.

MR. E. L. EVANS said that in regard to technical service the industry had not been too strong since nationalization. Many consumers of fuel had been rather disappointed by the response they had had from the board when they had submitted their problems. He asked if in the future the technical service would extend to the development of new processes and uses for coal. There was a foreshadowing of the transition from the production of coal as a primary fuel to fuel as a basis of chemical industry. The nationalization Act did not call upon the coal industry to promote those processes; but people such as the International Nickel Company, and others, in developing nickel, were giving a lead to future demand.

New Uses for Coal

MR. COLLINS agreed that until recently the board had not been in a position to give a technical service to consumers such as had now become available. He knew of one instance which seemed to show that the service was good, because it had persuaded a large company to change from oil to coal. The question of new uses for coal had been very much in the minds of the Government, and the Ministry of Power had set up a working committee to study new developments. Such work was not so simple as many would think or would like to think. Materials used in modern industry could be produced from coal or oil. Some of the chemicals were a little more difficult to produce from oil than from coal, *e.g.*, the aromatics. An important problem was that of ash content. But the subject was being very fully considered.

MR. W. DUNCAN (Scottish Branch) remarked that when we were beginning to suffer difficulties in regard to imports and exports, we still imported large quantities of oil. On the hydrogenation of coal, he asked for information concerning progress with the Fischer-Tropsch process.

Replying regarding the hydrogenation processes, Mr. Collins said that the Bergius system was not a failure technically; the difficulty was that of cost. The coal used had to be of very low ash content. There was no such process now using bituminous coal. There had been two plants working on brown coal, which was rather more reactive to the hydrogenation process than was bituminous coal, but in this country it was ruled out.

The importance of the Fischer-Tropsch process was that the basic material it required was simply a mixture of carbon monoxide and hydrogen, and it did not matter where that gaseous mixture came from. The Germans had used it because their demand for gas was so great that they were getting an excess of coke, and they had used the excess coke to produce a water gas, using the Fischer-Tropsch process to synthesize it. During the war they had developed the utilization of iron catalysts, which had enabled them not only to meet their requirements for aviation spirit, but also to meet demands for lubricating oil and diesel oil. There were two Fischer-Tropsch plants in Germany now, not directed mainly to the manufacture of oil, but to the manufacture of waxes and other raw materials needed by the chemical industry. The only such plant in the world that was working on a commercial basis was the SASOL plant in South Africa, which was using the Fischer-Tropsch synthesis.

A CARGO of 11,500 tons of pig-iron is to be loaded in Durban this month for companies in Japan, and will be one of many pig-iron cargoes to go to the Far East from South Africa this year.

THE 1960-61 EDITION of the Federation of Civil Engineering Contractors' Handbook contains all the main federation documents, including the working rule agreement of the Civil Engineering Construction Conciliation Board, conditions of contract, and dayworks schedules, together with alphabetical and sectional lists of the 690 members of the federation. The handbook costs 12s. 6d. Copies are obtainable from the Federation of Civil Engineering Contractors, Romney House, Tufton Street, Westminster, London, S.W.1.

BOTTOM-BLOWN OXYGEN FOR

Desiliconization of Iron

DRASTIC REDUCTION OF IRON OXIDE FUME

Production of a large volume of iron oxide fume is an undesirable feature of the LD process of iron refining by surface oxygen injection. A new method, which claims by bottom blowing with high-pressure oxygen drastically to reduce the make of fume, was described by G. Savard and R. Lee, both associated with the Canadian Liquid Air Company, Limited, Montreal, and M. R. Campbell (Dominion Iron & Steel Corporation, Sydney, Nova Scotia) in a paper presented at the 42nd conference of the National Open-hearth Steel Committee of the American Institute of Metallurgical Engineers. Employing specially designed injectors, the cooling effect of the oxygen flow itself eliminates the need for any external coolant. Extracts from the paper are given below.*

THE process employs a bottom-blown converter using pure oxygen at a minimum pressure of 400 lb./sq. in. Oxygen is introduced into the bottom of the metal bath through a specially designed injector. Tests began in an attempt to desiliconize hot metal in the transfer ladle by impinging oxygen on the surface of the metal. Through an extensive series of experiments, adequate oxygen efficiency was achieved, and a tendency of the metal to form layers was minimized. However, another problem was not solved; it concerned the generation of a large volume of iron-oxide fume.

Subsequent studies concluded that, if the reaction $2\ Fe + O_2 \rightarrow 2\ FeO$ could be effected at or near the bottom of the ladle, the FeO would be reduced by the silicon before reaching the surface, thus yielding the final reaction products of iron and SiO_2 neglecting reactions with manganese, etc. In other words, the reaction products, while passing through the molten metal acting as a scrubber, could be absorbed, and the volume of iron oxide fume reduced.

In 1954, experiments were started to prove this theory and develop an injector design suitable for driving oxygen through the molten bath without resorting to water cooling. These tests pointed to the desirability of multiple injectors, since numerous small reaction zones enclosed by molten metal were found better than one large zone. These injectors resulted in less fume, less splashing, and improved reaction with the oxygen.

Meanwhile, at another plant in Canada, large-scale tests were being carried out on 16- to 38-ton batches of metal, averaging 1.2 per cent. C, ferro-silicon being added to give an initial silicon content of 1.07 per cent. With an oxygen consumption of 255 cu. ft./ton, the final silicon content reached 0.28 per cent., and (based on the silicon oxidized) efficiency was over 100 per cent. However, premature injector burn-outs frequently occurred, and the iron escaped through the completely eroded injectors. With these tests, and other small-scale tests, sufficient data were gained to proceed with a pilot plant.

* Journal of Metals, July, 1960.

The Pilot Plant

In the pilot-plant tests, a modified 20-ton ladle, lined with standard fireclay ladle brick, was employed as a treating vessel. The number of courses of brick varied, because various weights of metal were treated, and it was desirable to keep the depth of the bath at a minimum of 3 ft. Oxygen at 200 lb./sq. in. for the plant was supplied by a bank of cylinders, thus making a precise record of oxygen consumption available.

The success of the process hinges on the appropriate oxygen pressure, and the design of the refractories and the injector assembly. The injectors must withstand the washing action of molten metal and oxides, the highly exothermic reaction of molten metal and oxygen and total immersion in the metal. Since there is no other means of cooling, the oxygen flow must keep the injectors from disintegrating. It does not require very high pressure to keep the metal from flowing into the injectors; hence, the pressure is controlled so as to maintain an optimum oxygen flow for cooling.

Desiliconization of Hot Metal

The first phase of pilot-plant work was carried out at the Sydney plant of the Dominion Iron & Steel Corporation in 1956 and 1957, its purpose being the desiliconizing of hot metal to a consistently low level through the high-pressure oxygen injection technique. The weight of metal at the outset, approximately 4 tons, was progressively increased until 12½ to 15½ tons were treated.

The pilot plant was set up at the mixer end of the open-hearth shop, where the hot metal was transferred by standard ladles. A metal sample for chemical analysis was first taken, followed by a thermocouple temperature reading. The treating vessel was then lowered to the horizontal filling position, and when filled was rotated back into the vertical blowing position. Meanwhile, the full flow of oxygen was blown through the nozzles, and until they were completely submerged, the

oxygen impingement on the surface of the molten metal caused a vigorous reaction, ejecting metal particles up to 30 ft. When the injectors were submerged, the amount of splash and fume decreased.

Fluxes were added at the beginning, and if necessary, also during the blowing period. The vigorous mixing action caused flux additions to be completely dissolved within 5 min. Experience showed that, when the silicon content reached from 0.2 to 0.3 per cent. the oxygen reacted with the carbon and agitation of the bath became more predominant, the CO flame noticeably increasing. In fact, if a constant record could be kept on the silicon content of the hot metal in the mixer, this treatment could be done on a time basis.

When the metal was desiliconized to the desired level the vessel was rotated to the filling position, a temperature reading taken, followed by a metal and slag sample. Then the metal was poured into a pit ladle and then back into the hot metal ladle, topped with the required weight of untreated metal from the mixer, and then charged into the open-hearth.

Pilot-plant Results

The results given are based on the average of nine consecutive heats carried out at the end of the programme, and were considered typical. The average weight of metal treated was 14.9 tons. The flux consisted mainly of mill scale 1.8 per cent., and burned lime, 1.5 per cent.; a small quantity of fluorspar, 0.14 per cent., was also added.

Tests with four injectors in parallel, each admitting approximately 56 cu. ft./min. of oxygen, were made, particulars of oxygen injection being as follow:—O_2 per heat, 3,293 cu. ft.; O_2 per ton, 221 cu. ft.; duration of injection, 14.4 min.; rate of O_2 flow, 229 cu. ft./min. The temperature of the metal during the blow increased from 1,270 to 1,400 deg. C. Based on the injection time of 14.4 min., the rate of temperature pickup was about 9 deg. C. per min. Table 1 shows the metal analyses before and after treatment. Silicon drop amounted to 0.045 per cent. per min. Noteworthy is the fact that three-quarters of the silicon content was oxidized, compared with about half of the manganese.

TABLE 1.—*Percentage Analyses of Metal in Desiliconizing Tests.*

	C.	Si.	Mn.	S.	P.
Before treatment ..	4.09	0.85	0.74	0.045	1.10
After treatment ..	3.81	0.20	0.37	—	—

The following was a typical percentage slag analysis at the end of the oxygen treatment:—CaO 23.80, SiO_2 52.80, FeO 4.13, MnO 12.75, MgO 5.79, and P_2O_5 0.15. Composition varied with the amount of flux added and the silicon and manganese removed. Although complete analyses were made for only eight heats, the FeO and MnO were determined for every slag; these averaged 5.19 per cent. FeO and 10.93 per cent. MnO. The thorough mixing action created by the bottom-injected oxygen permitted mill scale to be reduced by the metal bath, thereby supplying both oxygen and iron to the molten metal. The mixing action also helped the rapid formation of a fluid slag.

Oxygen and Iron from Mill Scale

In determining the volume of oxygen derived from the mill scale, certain assumptions were made:—(1) That the oxidized manganese of the hot metal entered the slag as MnO; that (2) mill scale was 100 per cent. Fe_2O_3; and (3) that the FeO content of the slag resulted from the partial reduction of mill scale, while the remaining mill scale reacted with the metalloids in the bath.

On this basis, the oxygen added to the process by the reduction of mill scale was 130 cu. ft./ton, but oxygen from mill scale remaining as FeO in the slag was 12 cu. ft. per ton. Thus, the oxygen which reacted with the metallic bath amounted to 118 cu. ft., *i.e.*, 91 per cent. of the oxygen added in the form of mill scale. Adding this figure to the oxygen injected, the total oxygen flow into the metal was 339 cu. ft./ton, and about 35 per cent. of the total oxygen was derived from mill scale.

On the same basis, 25.2 lb. Fe per ton of iron was added to the metal bath in the form of mill scale. Since it was assumed that the FeO in the slag was derived from the partial reduction of mill scale, the FeO in the slag accounted for 3.5 lb. Fe. Thus, 21.7 lb. Fe per ton of iron was absorbed by the metal bath from the added mill scale, which is about 81 per cent. recovery. This pickup more than compensated for the decrease in weight due to oxidation of silicon and manganese.

The oxygen efficiency, based on the analysis of metal shown in Table 1 and on the total oxygen added to the bath from injection and reacting mill scale was 87 per cent. It is not possible to visualize free oxygen escaping under such ideal conditions for chemical reactions; however, using the conditions imposed for the efficiency calculations, this was the figure obtained.

The work on desiliconizing iron with the high-pressure bottom-injection technique seems to indicate the possibility of consuming all the mill scale generated in an average mill. But for given silicon drop, the temperature pickup of the treated iron decreases with increased amount of mill scale. However, the intimate agitation created by bottom blowing provides flexibility for large variation of flux additions.

DECARBURIZING HIGH-CARBON IRON

A programme to decarburize high-carbon iron by oxygen injection was carried out at the foundry of Sorel Industries, Limited, Sorel, Quebec, Canada. The purpose was to lower the carbon content to a value suitable for further processing in the arc furnace and to evaluate the bottom injection process for refining the metal to specification without use of duplexing. Using the same pilot plant installed at Sydney, 10 heats were blown before hot charging into an 8- or 20-ton basic-lined arc furnace. Since the starting temperature of the iron was on the low side in some heats, ferro-silicon and ferro-manganese were added at the start of the

oxygen blow in order to arrive at a higher final temperature.

The percentage analysis of the iron prior to blowing was C 2.3 and max S 0.05 with very low concentrations of silicon, manganese, phosphorus, copper, tin, and other trace elements. Some of the heats were blown to approx. C 0.3 to 0.5, and one to the end point. Metal samples and temperature readings were taken before and after oxygen injection. The decarbonized metal was tapped into a transfer vessel and charged into the arc furnace for further refining.

The average reduction in carbon content was 1.9 per cent., with a final carbon content of 0.4 per cent. A wide scatter of results was found, since for most tests the starting carbon was not known until after oxygen injection. Most of the silicon and part of the manganese, added at the start of the injection, were oxidized.

The volume of oxygen injected averaged 716 cu. ft./ton of iron. Based on the theoretical oxygen requirements, for the oxidized amount of carbon, silicon, and manganese, the efficiency was 93 per cent. Starting temperature varied from less than 1,300 to over 1,400 deg. C.; final temperature was between 1,440 and 1,650 deg. C. An average additional 68 deg. C. increase in temperature was obtained by the addition of 0.35 per cent. Si.

The metal can be partially refined by high-pressure oxygen injection and charged into the arc furnace for further refining. It also can be converted to steel without additional refining; but for this series of heats the arc furnace provided the required control of chemical composition for an order of special low-alloy steel.

The choice of oxygen operating pressure depends on many factors. As a guide in desiliconizing hot metal a pressure greater than 400 lb./sq. in. is necessary to avoid burn-off. When higher temperatures are encountered, as in refining high-carbon iron where the final temperature is over about 1,630 deg. C., a pressure higher than 600 lb./sq. in. is necessary. In some instances, heats were treated at over 1,200 lb./sq. in. oxygen pressure.

Conclusions

By dividing the total oxygen flow into a series of multiple jets, intimate contact between the oxygen and metal was achieved—although the evaluation of the factors suggests a radically different vessel design from the one used in the pilot-plant tests. That suggested is horizontally tubular in shape with the front top quarter cut away for charging and blowing. Tapping is effected through an outlet in the bottom of the vessel when in the upright position, slag being removed by tilting it forward through 90 deg.

If the bath is sufficiently deep, the oxygen efficiency will be high and iron oxide fume will be reduced to a minimum. The multiple reaction zones in the bottom of the vessel produced agitation, which by nature had little wear on the refractory lining. In fact, even with standard ladle fireclay brick there was little erosion.

The combination of ladle design and bottom blowing affords good control of the blowing operation. The carbon can be stopped at any point, thus making the process available to the whole range of carbon steels. The injection of high-pressure oxygen at the bottom of the treatment vessel without attendant water cooling of the injectors simplifies installation. If the injector performance proves to be reliable on an industrial scale capital and maintenance costs, in the authors' opinion, should be reasonable.

BICC's PART IN NEW RAIL ELECTRIFICATION

INAUGURAL ceremony for the new electric service between Manchester and Crewe, operating at 25kV., 50 cycles a.c., took place on Monday and marked the completion of another railway electrification contract by the British Insulated Callender's Cables, Limited, group, which designed, supplied, and installed the overhead equipment. This is the first main line in Britain to operate on a high voltage a.c. system and forms part of the overall plan to electrify the main lines between London and industrial centres of the north-west.

Construction work on the contract began in 1957 and involved a total of 217 track miles. It included the congested junction at Crewe, where the complicated arrangement of tracks called for special study. Altogether, the overhead equipment is supported on some 3,000 structures which accounted for 6,000 tons of steel and required 22,000 cu. yd. of concrete for their foundations. These supports are generally of the single-track cantilever type, using broad-flange beam masts, but welded rod and lattice steel portal structures were used for multi-track work and in the stations. They carry simple and compound catenary systems on various parts of the route. The manufacture of catenary and contact wires absorbed 900 tons of copper.

Special rail-mounted mechanical plant was developed and new installation techniques were devised to ensure rapid progress and economize in manpower and materials.

The BICC group has also supplied and laid the telecommunication cables required in association with the electrification contract. The main cables comprise a 14-pair carrier quad cable between Crewe and Manchester, together with a 104-pair audio quad cable from Crewe tapering to 54 pairs at Slade Lane Junction. There is also a 38-pair audio quad cable from Crewe to Cheadle Hulme. To provide for the Stockport-Manchester line 104-pair and 54-pair audio quad cables are installed between Cheadle Hulme and Manchester Piccadilly. Considerable subsidiary cabling has been undertaken at a number of locations.

Iron-ore Mining in the North-western Cape

IN the semi-desert regions of the north-western Cape, 130 miles to the north-west of Kimberley, where temperatures often reach 115 deg. F. and the annual rainfall is 14.37 in., lies the Manganore iron-ore mine. Conditions in the open-cast pits sited along the length of the Postmasburg ore deposits, one of the largest deposits of high-grade iron ore in the western world, are arduous. At Manganore, a mine in the African Metals Corporation group and one of the mines working the Postmasburg deposits, the ore is extracted by open pit methods. Here, mining of manganese deposits, which occurred in pockets in the hills below the iron ore, have ceased, but the mine produces ore, with an iron content of up to 66 per cent. Fe, and plans are afoot to step up production. All of the production of this mine is railed to the AMCOR works at Newcastle in Natal, where it is converted into pig-iron.

The rock at Manganore is among the hardest found anywhere in the world, and much of it is badly fissured. The combination of these two circumstances makes drilling an extremely difficult task and so far no satisfactory method of longhole drilling has been found. After drilling a single hole to a depth of 2 ft., the tungsten-carbide-tipped drill steel bit has to be sharpened before it can be reused. Most holes cannot be drilled deeper than 2 ft. During drilling the water used for cooling the drill tip turns blood red as it mixes with the oxide in the iron ore. After blasting, the rock is loaded by a diesel-driven mechanical shovel into Euclid rear dumps and taken along the winding hillside roads to the crushing plant, where it is crushed to $+\frac{3}{8}$ in. to $-1\frac{1}{2}$ in. before being carried into tubs operating on an endless rope haulage to the loading bins from which it is loaded into waiting railway trucks.

Operations started recently at the mine's new "Doornpunt" section, where three Atlas Copco AR4 compressors are supplying air to the 17 Atlas Copco BBE12 DK rockdrills used at the section. The BBE12 DK rockdrill is a special purpose high-speed machine designed expressly for hard-rock drilling. It is the only machine manufactured which has separate rotation, permitting the full piston power to be utilized for stepping up the percussion action. The rate of impact is 4,800 strokes/min. and the rate of rotation 275 r.p.m. The weight of the machine is 53 lb. and it works at a normal gauge pressure of 80-100/sq. in. Sandvik Coromant tungsten-carbide-tipped drill steels are widely used on this mine.

Eighty-five miles north of Manganore lies Hotazel, the farm on which S.A. Manganese's newest mine is situated. Water for the mine is piped from a reservoir in the hill some 12 miles away. Mining operations started early in 1958 and already over 1,000,000 cu. yd. of soft yellow sand which constitutes the overburden in this area has been removed to uncover the ore body, which is rich in manganese. The overburden, which is 60 ft. deep, is being stripped by electrically operated shovels which load it on to 22-ton dumpers and other pneumatic-tyred vehicles for offloading on the nearby waste dump.

Until the railway reaches Hotazel the ore is being hauled by heavy road vehicles to the railhead at Sishen, 40 miles distant. Sishen is the site of an iron-ore mine belonging to the South African Iron & Steel Industrial Corporation, Limited (Iscor). The compressed-air needs of Hotazel mine are supplied by three Atlas Copco AR4 compressors. The compressors at Manganore are diesel driven and those at Hotazel are electric-motor driven. All operate at 485 r.p.m. and have a free air delivery of 855 cu. ft./min. at a working pressure of 100 lb./sq. in., which can be increased to 125/sq. in. if necessary.

AN ATLAS COPCO BBE 12 DK ROCKDRILL IN OPERATION AT MANGANORE. THIS IS A SPECIAL-PURPOSE HIGH-SPEED MACHINE DESIGNED EXPRESSLY FOR HARD-ROCK DRILLING.

NATIONAL COAL BOARD specifications just issued cover concrete aggregates from natural sources (No. 192/1960), flexible steel conduit and adaptors for the protection of electric cable (193/1960), and bitumen macadam with crushed rock or slag aggregate (194/1960).

Summing up his paper, which he presented to the 1960 annual conference of the National Association of Colliery Managers, the author said that big changes were bound to lie ahead of the industry. The growth of nuclear energy would have an important effect, but the overall need for energy was growing and would continue to grow rapidly. For the foreseeable future the bulk of requirements must be met by coal.

FINANCIAL PROBLEMS of the COAL INDUSTRY

*By A. W. JOHN**

DURING the past few years we have seen sudden vital changes take place in the coal industry. They have had to be countered by rapid and, indeed, abrupt, but still considered, changes in policy to meet the new circumstances and to prevent them dominating the industry, with perhaps serious and long-term damage to its prospects.

Financial problems have not arisen only during the past few years; they have always been with us in some degree, but in the board's earlier years the main preoccupation was the chronic shortage of coal and, of necessity, other problems had to take second place. This has had its effect upon our affairs today. The financial difficulties have grown with the years and have now reached their peak, at a time when new problems have arisen to aggravate them—the problems of surplus output and of growing competition with other fuels.

The days of insatiable demand for coal are over; the days have also gone when we might readily have accumulated the financial resources to enable us to face our difficulties with some equanimity. We were not allowed to accumulate those resources and we are left with the problems, which have grown over the years and which must now be faced squarely, without the protection and strength which we might have had.

Statutory Obligations

In order fully to understand the situation, we must first consider our obligations under the Coal Industry Nationalization Act, 1946, and subsequent Acts which govern our operations.

The 1946 Act charges us with working and getting the coal in Great Britain, securing the efficient development of the industry, and making supplies of coal available, of such qualities and sizes, in such quantities and at such prices as may seem to the board best calculated to further the public interest. We are to direct our policy to secure, consistently with the proper discharge of those duties, that the revenues of the board shall not be less than sufficient for meeting all outgoings, properly chargeable to revenue account (including the provision of a reserve fund) on an average of good and bad years.

It will be seen from this that we are not precluded from making profits. Indeed, the provision of the reserve fund implies that we will make profits. We may make losses in any individual year, but these losses must be recovered within a few years. But all these financial aspects are subject to the obligation to further the public interest.

Financing the Industry

The only financial source from which the board can borrow money (apart from small temporary borrowing powers) is the National Exchequer, and the extent to which we may borrow is provided for in the Acts. The limit of advances provided in the 1960 Act (that based on the "Revised Plan for Coal") is £750,000,000. Since this money is only borrowed, it must be repaid in due course; until then, interest at the appropriate rate must be paid. The appropriate rate is that at which the Treasury borrows the money to lend us, plus a small margin. In lending money to met our financial requirements, the Exchequer gives no subsidy, therefore.

In the end, all our financial operations are reflected in our borrowings from the Exchequer. To the extent that our internal resources are insufficient to provide for our capital expenditure, we must borrow. Our stocks of products and our stocks of stores must be financed by borrowing. If we make losses in our operations we have to withdraw our money from other uses, and our borrowings from the Exchequer are thereby increased. The higher our borrowings, the more interest we have to pay, and this in turn affects our profits; and, of course, the more we borrow the longer will it take us to repay the loans.

When the coal industry was nationalized an independent tribunal assessed the price at which it was to be taken over, and Parliament accepted this figure and fixed the basis upon which we acquired the ancillary assets and undertakings. The value finally placed on colliery assets was £298,000,000, and that on other assets £90,000,000. There was no element of confiscation and no element of subsidy and the price fixed was not ungenerous. The former

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owners were paid out by the Government partly in Government stock and partly in cash, but the liability was immediately passed on and the industry became liable to the Government for compensation, meeting both repayment of the principal and interest on the outstanding balance borrowed. At the end of 1959, we still owed £356,000,000 of the original £388,000,000.

Reconstruction of the Industry

The condition of the industry at the end of the war and the demand for coal to meet the country's urgent needs made it imperative that we should embark forthwith on a large-scale programme to reconstruct the industry, to sink new collieries, to build such coal-preparation plants as were needed, and, in general, to improve and expand the industry.

The first " Plan for Coal " was designed to obtain 240,000,000 tons of coal per annum by 1965, and was published in October, 1950. A revision of this plan (" Investing in Coal ") was made and published in April, 1956, in view of the radical changes in costs and other factors which had occurred since the original plan was compiled. A further review (" Revised Plan for Coal ") was made and published in October, 1959, which took account of changes in the estimated demand for coal, which was now based on 200,000,000-215,000,000 tons per annum by 1965, with a reduction of £95,000,000 in capital expenditure.

It is expected to increase productivity from 25.3 cwt. in 1958 to 30-31 cwt. in 1965.

The extent and success of our capital programme can be measured by the fact that, by 1965, roughly 80 per cent. of our coal production will be " new " coal, coming either from new pits or drifts or from collieries which have undergone reconstruction. The programme will have involved 28 major new pits and drifts, and 223 major colliery reconstructions; the expenditure of some £365,000,000 on minor reconstructions; the building of a large number of new preparation plants; and the sanctioning of 17 new coke-oven schemes (including 10 extensions and rebuilds). As a necessary adjunct, we will have built some 350 medical centres and the same number of pithead baths, providing 95 per cent. of our workmen with free bathing facilities.

Such gigantic rebuilding of the industry involves heavy capital charges which can only be met out of the greater efficiency and economy that should result. Until these results are obtained from the expenditure the financial burden remains. We have not yet seen the full measure of the improvement that we need, but revenue productivity (by which we must measure our efficiency) has already improved to 26.9 cwt. in 1959 and is currently running above 28 cwt.

By the end of 1959 we had incurred capital expenditure of £877,000,000, of which £414,000,000 had been met from our own resources. For working capital, we required £122,000,000, mainly for financing stocks of coal and coke. We had therefore, borrowed the sum of £585,000,000.

Concurrently with the reconstruction of the industry, we have been confronted with a growing demand for coal. Inland consumption in Britain rose from 178,000,000 tons in 1938 to 213,000,000 tons in 1957, and the demand from abroad could not be met. Our output (including open-cast coal) rose from 197,000,000 tons in 1947 to 224,000,000 tons in 1957, but we were forced to import over 26,000,000 tons from abroad. The cost of this was heavy indeed. Inland prices of coal in this country have been lower than elsewhere in western Europe; the average premium on exports which we received from 1949 to 1957 (and could have received on a higher tonnage) was about £1 per ton, but the coal which we had to import was sold on the inland market at prices which were up to £3 per ton and even more below the import cost. The loss on imports has totalled £74,000,000 all of which has been carried by the industry.

A further restriction on the board's freedom of action has been the " gentleman's agreement " whereby the board undertakes to make no general increase in prices without first consulting the Government and seeking its views as to the national interest. Only three (out of a total of 10) applications for general price increases have been approved in full with effect from the date proposed by the board.

The remaining seven have been delayed and/or reduced, or refused. As the result of all these factors, our deficits have mounted as inflation has forced up the levels of wages and the prices of materials without corresponding increases in the price of coal.

Summing up, we can see that the accumulated deficit and lack of any revenue reserves is attributable to the following causes:—(*a*) The steady increase in costs due to inflation; (*b*) the restrictions on selling prices due to the " gentleman's agreement "; (*c*) the need to import coal at substantial loss; (*d*) the need to meet demands for coal involving the continued working of uneconomic collieries; (*e*) the burden of modernizing the industry simultaneously with all the above.

Slackening Trade

Towards the end of 1957, a new problem started to appear—formidable in its implications. It was clouded to some extent by other factors, and the full measure of it was not at first realized. With extreme suddenness the country moved from shortage of fuel to surplus. This was the result of four main factors—firstly, the commencement of a recession in industry with falling consumption both at home and abroad; secondly, and partly resulting from the first, a much greater efficiency in the use of fuel which reduced consumption (which was, of course, something that the board had urged for years); thirdly, unexpectedly prolonged mild weather; and fourthly, a world-wide surplus of oil resulting in encroachment into coal markets everywhere.

As a result, the board's coal stocks rose very rapidly, so that by the end of 1959 they exceeded

36,500,000 tons. The export markets on which we might have expected to rely were already heavily bought and have practically closed up for the past two years.

This radical change has caused great difficulties. The coal industry is not readily flexible or susceptible to sudden change, and a period of slowing down was necessary before it could go into reverse, but it was possible to discontinue Saturday working after April, 1958, when the annual agreement expired and was not renewed. But if the stocks of coal which have accumulated are to be lifted, it is necessary to produce less than is being consumed. Proceeds are reduced, and the task of reducing costs becomes more difficult because the fall in output tends to increase costs and to curtail profitable production from open-casting.

This has meant that we have had to eliminate the most unprofitable or most unsaleable part of our output, within the limitations imposed on us by social and other considerations.

Colliery Closures

Towards the end of 1958, we reviewed the situation carefully, and decided that it was necessary in 1959 to close 36 uneconomic collieries in addition to collieries falling out from exhaustion. These closures involved 16,000 men, but the board carried them through with such special care that, in the event, only some 300 men of working age failed to find further employment. Late last year the situation was again reviewed carefully, and it was decided to be necessary in 1960 to close only six uneconomic collieries in addition to those falling out from exhaustion. In addition, other steps have been taken to curtail production by eliminating unprofitable faces or those producing coal that is not saleable.

These apparently drastic steps have still left the board to face substantial stocking of coal. Between the end of 1957 and the end of 1959 the board's stocks of coal, *i.e.*, the "undistributed" stocks, rose from 9,500,000 tons to 36,500,000 tons. In 1957, inland consumption and exports totalled 221,000,000 tons and in 1959 they had fallen to less than 195,000,000 tons, a decrease of some 26,000,000 tons. We hope for some increase in consumption in 1960, perhaps of the order of 3,000,000 to 4,000,000 tons; even so the board will have suffered a decrease in consumption of 22,000,000 to 23,000,000 tons. This broadly corresponds to the stock increase since the end of 1957.

Getting rid of these stocks will be no simple matter. Our main stocks lie in small or unscreened coals, and in some parts of the country we are still adding to these stocks, though on balance we expect to lift stocks in 1960. We have therefore not only to produce less than is being consumed, but also to produce a good deal less of the small coals and more of the graded and large coals. If we can do this, we shall build up a stock assorted in the proportions of grades and qualities now being consumed. A well-assorted stock is the only real protection for all our consumers.

Inevitably this means that we must increase the proportion of large coal, and, from the financial viewpoint, this should be highly beneficial if it can be achieved at good efficiency. This is a main and most urgent challenge both to our technical colleagues and to those in line management.

It is now the board's objective not to increase its stocks of coal and to make a start in lifting stock. Already mentioned are the cessation of Saturday working, reduced open-casting, the closure of collieries and of coal faces, and the concentration of working.

We are also trying positively to hold and increase our market whenever possible. We have strengthened the marketing department with a technical sales service. Arrangements have just been made with an independent organization for personal loans to firms or householders installing solid-fuel appliances on terms as favourable as any obtainable elsewhere, if not more so. Against the background of the rising demand for energy, we feel confident that we can increase sales of coal in many fields, and this is the basis of the revised plan. But we must not only give service, we must also make price and quality right.

On price, we had nine price increases ranging from 2s. 6d. to 11s. 4d. per ton in our first 11 years and only three years were free from annual increases. For the last three years, despite all our problems, we have held prices stable and, subject to factors over which we have no control, we hope to continue to do so.

Quality, and particularly consistency of quality, is, however, the factor which, in the long run, does most to improve our position. Our record in the years of shortage of coal has not been blameless. Now that demand has to be stimulated, it is of compelling importance that quality be improved and then kept at the most consistent level attainable by good mining and coal-preparation methods. Particular attention, for example, should be given to the ash content of untreated coals, an increase in which not merely reduces total income, but may lose valued customers.

We can feel reasonably confident that by controlling production and by our efforts to retain our markets, we shall achieve the first and main objective—the disposal of our surplus stocks—and, with a more compact, but smaller industry, implement our plans for the future, maintaining a reasonable level of production to supply a market not, of course, at the level of 240,000,000 tons, as envisaged in the first national plan, but one that should at all events exceed 200,000,000 tons for a long time ahead.

Extent of Financial Problem

Let us now see where our problems have led us on the financial side. In 1947, the first year of nationalization, the board incurred a loss of £23,500,000 because prices were not raised sufficiently or soon enough to overtake the costs of the five-day week and of the subsequent reintroduction of Saturday working. By the end of 1958, the

accumulated loss was £32,500,000, an increase of only £9,000,000 in the next 11 years. In 1959, due to the decline in demand, and the need to stock coal extensively, the deficit increased by nearly £24,000,000. If we had been able to sell all the coal we produced in that year we should have shown a small surplus.

It has already been stated that the Coal Industry Nationalization Act requires that the revenue of the board shall not be less than sufficient for meeting all its outgoings properly chargeable to revenue account on an average of good and bad years. Between 1947 and 1959 our total turnover was £8,689,000,000 and the accumulated deficit is only some 0.6 per cent. of the total. Nevertheless, there should be no deficit, and it must be recovered as quickly as possible. If the selling price of coal had been only 5d. per ton higher over the years there would have been no accumulated deficiency; a little more and we should have had the reserves which any prudent business organization would expect to hold. Thus it is that only by the narrowest of margins have the price policy and economic compulsions over these years prevented us from building up the financial resources which today would have been so valuable in the fight to maintain our markets.

Important Achievement

At the end of 1957 the board tackled with the greatest energy and resolution the problem of reducing costs and expenditure. The closure of uneconomic collieries, steady reductions of manpower and of overtime, and increasing productivity have lowered wages costs. Wages costs for 1958 were 44s. 11d. per ton compared with 44s. 8d. per ton for 1957, but at the end of 1958 we were already running well below 1957. For 1959 wages costs were 1s. 4d. per ton below 1958, despite the full effect of the daywage agreement effective in September, 1958, and are still showing further improvement to date in 1960. This is a very important achievement.

Materials consumption has been substantially reduced. In 1958, costs were held at the same level as in 1957, and in 1959, despite reduced output, have been reduced by over 1s. 3d. per ton—another great achievement.

Fuel and power costs are being subjected to technical review in conjunction with a general drive for maximum economy and already substantial savings have been made (4d. on 4s. 10d. in 1958).

Non-operational expenditure was consolidated at the levels obtaining in the latter part of 1957, and has since been reduced. The growth of non-industrial staff has been checked, and is now being reversed in conformity with closures of collieries and reducing numbers of men employed.

All our ancillary activities have been critically examined to ensure that we are getting the best possible results from them. Those which are hopelessly uneconomic and can be dispensed with have ceased operations.

In fact, all our expenditure of every class has been and is being subjected to the most critical examination to ensure that no expenditure is incurred that can be avoided. This applies also to capital expenditure so that we can hold in check the annual increase of depreciation and interest charges while we gain full advantage from expenditure already incurred.

Both in 1958 and in 1959, we would, but for stocking costs, have shown a small profit. In 1960, the task is manageable even though we have to overcome the effect of lower output, the loss of open-cast profits, and higher interest both on stocks and on capital expenditure. But we have the benefits of the reductions in costs we have already made and of the closures that have taken place, the increase in productivity due to the reduction in the number of men we employ, as well as the benefits of the reconstruction schemes and other capital expenditure incurred.

If demand is maintained at the levels we expect, the measures taken will result in the disposal of our surplus stocks. When that happens, our production can again be increased and we shall then reap the full benefit of the efforts to reduce costs and will have cut away a great part of our uneconomic production.

The board must take advantage of the reduced demand for coal to dispense with uneconomic production and to seek greater efficiency, and since it cannot increase its income it must reduce its expenditure.

Finally, what of the future? The 200,000,000-215,000,000 tons of output, which is the 1965 objective of the latest revision of the national plan, will be produced from a smaller and more compact industry working more effectively and more efficiently. Before 1965, about 200 pits will close, most of them from exhaustion of reserves, and manpower is expected to be between 587,000 and 626,000 men.

The reconstruction programme will be largely finished and the growth of borrowing will cease. Indeed, we should be approaching the time when we shall commence to reduce our outstanding borrowings.

I believe that we shall then see the benefits of all the efforts made since 1947, and we shall see the industry on a financial and ecenomic foundation as firm and secure as ever.

Big changes are bound to lie ahead of us. The growth of nuclear power will have an important effect, but the overall need for energy in this country is growing and will continue to grow rapidly. For the foreseeable future the bulk of requirements must be met by coal.

DISCUSSION

MR. DEAN HARRISON said that Mr. John had pointed out the way in which the industry's costs had run down during the last years. It would be well to draw attention to the fact that a good deal of the saving was effected by reason of the board's non-recruitment policy. Trainees were costly, for it was necessary to pay them wages although they did little productive work, and the result was a reduced output

per manshift overall. Some day it would be necessary to resume the recruitment of trainees.

MR. JOHN said that clearly the pipeline of trainees would have to be refilled, as Mr. Harrison had emphasized. But it seemed to him that there was still a further rundown of manpower ahead.

MR. E. L. EVANS thought managers should be told exactly how the stock in hand was debited to revenue. Was it put down and picked up again in one year, or were credits given for the coal that was put down? Tankers loaded with oil were coming in for three years before the oil boom came along. Surely there should be a spread-over of the stocks of coal to cater for a new boom in the demand for it in the future.

Mr. Evans also asked if there were any way in which financial accountancy could support the social accountancy which Mr. John had put forward in his paper. The reduction of output, while maintaining capacity and ensuring a very slow rundown of manpower, meant, in fact, paying the cost of labour which was not fully productive, whereas in the old days perhaps the men would have had to work part time. He felt that the industry should be given social credit for having taken that step.

MR. JOHN said there was some confusion about the keeping of stocks. The industry produced something which, even though it had to go into stock, had a very substantial value, and in the revenue accounts the board considered it right to take credit for the appropriate part of that value. In putting coal on to the ground they had to employ men and machinery, and that was a charge on the expenditure side of the collieries' profit and loss accounts. They had then to put a value on to the coal, and the basis that was adopted was the value which the coal would realize if it were sold at that time—as treated smalls, untreated smalls, and so on. Having put the coal on to the ground, when it was lifted it suffered degradation. By the very action of putting it on to the ground they had caused that loss to occur as a certainty ahead, and provision must be made for it. There was also a lot of waste, and that had to be allowed for as well. Sometimes there was a loss of quality, and allowance had also to be made for that.

Oil Industry's Stocks

On the question of oil stocks, Mr. John said that his impression was that the oil industry, like the coal industry, had always worked on a very fine balance of stocks; it did not carry heavy stocks normally. When the oil people were faced with heavy stocks they had to re-cost; whether the costs were of the same order as those of the coal industry he did not know, but he would doubt it.

Mr. John said there was no doubt that the process of coal stocking had saved the Government a great deal in the way of unemployment payments.

MR. ROBERT WILLIAMS said that if the industry's finances were presented as they would be by a company it could be shown that the coal industry was at least breaking even. But it was attacked in the Press, and the most responsible journals set out its financial position always in a manner which was detrimental to the industry's public relations. He asked what Mr. John would suggest should be done to counter such attacks.

MR. JOHN agreed that the public's reaction to what the industry did was unfair. But the public would assess the position finally on whether the board's accounts showed a profit or a loss; and in the long run, if the industry did not get out of these losses, he felt the public would be right to judge it as having failed to carry out its duties. In the meantime it was extremely important that the situation should be presented quite clearly to the public; and he was quite certain that the members of the board would lose no opportunity to do so. But the best ambassadors were the 700,000 people who were working in the industry. They could speak to their friends and everybody else of what they knew—and it was the purpose of a conference such as that of the NACM to enable people to know what was being done.

MR. J. S. CARSON, voicing the thanks of the conference to Mr. John for his paper and his handling of the discussion, said that the best way in which to show gratitude to the members of the board and to the executive directors at Hobart House was for the managers in their own jobs to make still greater efforts. Mr. John had given them further inspiration to do that.

Coal Exploration in Pakistan

EXPECTED to be signed shortly is an operational agreement between the Government of Pakistan and the United Nations Technical Assistance Board which will allow the implementation of a mineral exploration programme. Out of the UN special project fund allocation of $1,500,000, a major sum may be utilized for drilling at Bogra in an attempt to locate coal at a depth of between 2,000 and 3,000 ft. Foreign experts have visited the high-quality coal deposit at Bogra, which seems to be an extension of the Indian coal belt.

The problem now is to locate coal seams at workable depth; samples have been obtained from a test drilling at a depth of 9,000 ft., which is considered to be too deep for economic mining operations. The United Nations will be sending out experts and may also arrange drilling contracts to help to implement the mineral exploration projects.

NACM: South Wales Branch

OFFICERS of the South Wales Branch of the National Association of Colliery Managers for 1960-61 are:—President, Mr. D. A. N. Simpson; vice-presidents, Prof. J. Sinclair, Mr. P. G. Weeks, and Mr. A. Maddox; hon. secretary, Mr. G. W. Knoyle; hon. assistant secretary, Mr. A. L. H. Jones; hon. treasurer, Mr. P. B. Rees.

Members of the branch council are:—AREA NO. 1: Mr. J. D. Haydn Davies, Mr. Rufus Morgan, and Mr. J. H. Pedley; AREA NO. 2: Mr. J. D. Llewellyn, Mr. V. H. Evans, and Mr. F. Stacey. AREA NO. 3: Mr. G. Hodkin, Mr. W. D. Evans, and Mr. J. H. Jones; AREA NO. 4: Mr. D. Davies, Mr. V. Lewis, and Mr. R. N. Lewis; AREA NO. 5: Mr. H. C. Bisp, Mr. J. Williams, and Mr. H. L. Nash; AREA NO. 6: Mr. R. Williams, Mr. F. C. Thompson, and Mr. J. Pocock; AREA NO. 9: Mr. E. G. Maggs, Mr. John Williams, and Mr. W. G. Snape; SOMERSET AND BRISTOL: Mr. R. Macdonald; OTHER MEMBERS: Mr. J. Jenkins and Mr. R. Frew.

AUSTRALIAN EMBASSY OFFICIALS in Tokio are trying to interest the Japanese aluminium industry in the purchase of bauxite from northern New South Wales. It is estimated that there are 15,000,000 tons of bauxite in deposits around Inverell, Tingha, and Emmaville.

New Patents

PATENTS below are among the complete specifications accepted listed in the Official Journal (Patents). The numbers given are those under which the specifications have been printed and all subsequent proceedings will be taken.

Applications for copies of the full specifications (3s. 6d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

Mining and Mining Appliances

842,043 MONTECATINI SOC. GENERALE PER L'INDUSTRIA MINERARIA E CHIMICA. Safety electric primers for mines protected against ignition by extraneous electric currents.

842,028 EGGEMANN, W., and CAMPENHAUSEN, VON E. (trading as SCHWARZ KOMM. GES., H.). Setting wedges for collapsible props.

841,806 CROUCHER, A. H. Ploughs of the type suitable for mining operations.

842,137 SOC. D'APPLICATIONS GENERALES D'ELECTRICITE ET DE MECANIQUE S.A.G.E.M. Safety device, especially for coal-cutting machines.

842,609 COAL INDUSTRY (PATENTS), LIMITED. Equipment for filling sacks with comminuted material from containers.

842,700 COLMOL COMPANY. Mining machines.

842,706 MYARD, J. Boring apparatus for use in mines and quarries.

842,614 COAL INDUSTRY (PATENTS), LIMITED. Mineral-mining machines.

842,452 RHEINSTAHL WANHEIM G.M.B.H. (formerly EISENWERK WANHEIM G.M.B.H.). Piston pumps, more particularly for hydraulic pitprops.

842,903 PITTSBURGH CONSOLIDATION COAL COMPANY. Method of separating solid materials and apparatus for carrying out the method.

842,575 FARMER BROS. (SHIFNAL), LIMITED. Ducting for ventilation systems in mines and other underground workings.

842,273 BARKER & SON, ENGINEERS, LIMITED, W. H. Shoots for coal or other tipplers.

842,506 AUTOMATIC COAL CLEANING COMPANY, LIMITED. Bucket elevators and scraper conveyors.

842,801 MINING ENGINEERING COMPANY, LIMITED. Chocks for supporting roofs in mines and like workings.

842,701 COLMOL COMPANY. Mining machines.

Metallurgy and Engineering

842,106 UDDEHOLMS, A. B. Ingots of killed steel or other metal to be hot rolled.

842,024 THRING, M. W. Utilizing the waste heat of furnace gases and in cleansing thereof.

841,646 HOLM, C. J. Method and a device for the production of Lang's lay steel wire cables without producing a twisting grain.

841,809 BOFORS, A. B. Austenitic alloy.

841,670 HUTTENWERK SALZGITTER A.G. Charging devices for shaft furnaces.

842,893 LINDBERG ENGINEERING COMPANY. Furnace ladling apparatus.

842,392 FISHER & LUDLOW, LIMITED. Endless belt conveyors.

842,399 OELLRICH, A. (trading as MASCHINENFABRIK UND EISENGIESSEREI A. BEIEN). Endless conveyors with superimposed runs, for example double chain scraper conveyors.

842,588 DAUSSAN, H. J. Method and a device for casting steels and other ferrous compounds in ingot moulds.

842,518 EISENWERKE MÜLHEIM/MEIDERICH A.G. Charging of furnaces.

842,687 DAUSSAN, H. J. Method and device for treating an ingot or the like in the course of its solidification in an ingot mould or the like.

842,951 COMPAGNIE DES ATELIERS ET FORGES DE LA LOIRE. Steels having a high boron content.

842,853 VEREINIGTE LEICHTMETALLWERKE G.M.B.H. Method of producing rolled metal plates traversed by channels.

842,858 CHARROLD, LIMITED. Belt conveyors.

842,859 CHARROLD, LIMITED. Belt conveyors.

Fuel Treatment and Utilization

841,610 KOPPERS G.M.B.H., H. Process for purifying coal distillation gases.

842,711 SIMON-CARVES, LIMITED. Removal of coal dust from air and gases.

842,401 COPPEE COMPANY (GREAT BRITAIN), LIMITED, and SANSAM, W. Apparatus for washing coal, ore, or the like.

842,662 STILL, K. F. (trading as STILL, C. (firm of)). Apparatus for avoiding dust nuisance during the filling of coke ovens.

842,686 SUMITOMO CHEMICAL COMPANY, LIMITED. Feeders for powdered substances, in particular pulverized coal.

FORTHCOMING EVENTS

SEPTEMBER 21

Mining Institute of Scotland:—Meeting at the Royal College of Science and Technology, Glasgow, at 5.15 p.m. "Mine Car Circulations," by J. W. Pirie, chief engineer, Scottish Divisional Coal Board.

Institution of Production Engineers:—Meeting at the Royal Commonwealth Society, London, at 6.30 p.m. "The Cult of the Self-made Man" (E. W. Hancock paper), by John Marsh, director of the Industrial Welfare Society.

SEPTEMBER 26

Institution of Plant Engineers (West and East Yorkshire Branch):—Meeting at the Houldsworth School of Applied Science, Leeds University, at 7.30 p.m. "Fuel—Economy and Productivity," by K. Higginson.

SEPTEMBER 27

Institution of Plant Engineers (South Wales Branch):—Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 7.30 p.m. "Electric Welding Applications for Plant Maintenance and General Fabrication," by C. V. Lewis.

Society of Instrument Technology:—Meeting at Manson House, 26, Portland Place, London, W.1, at 7 p.m. "Gas Sampling for Automatic Combustion Control," by R. Hardy, and "Smoke Density Measurement," by G. H. Laycock.

SEPTEMBER 30

Institution of Plant Engineers (Birmingham Branch):—Meeting at the Imperial Hotel, Temple Street, Birmingham, at 7.30 p.m. "Metal Stitching," by N. Tinwell.

OCTOBER 3

Institute of British Foundrymen (Sheffield Branch):—Meeting at the Technical College, Pond Street, Sheffield, at 7 p.m. Presidential address.

OCTOBER 8

North of England Institute of Mining and Mechanical Engineers:—Meeting in the Lecture Theatre, Neville Hall, Newcastle-upon-Tyne 1, at 2.30 p.m.: "The Use of Hydraulics with Coal Ploughing," by R. R. G. P. Jackson, T. Harris, and T. Sneddon.

National Association of Colliery Managers

OCTOBER 3

South Midland Branch:—Meeting at Ashby-de-la-Zouch Rescue Station. "A Report on Safety, showing Accident Trends," by H. G. Mitchell and A. Chaplin.

CHINA—*Some Items of Metallurgical Interest*

An insight into the metallurgical developments taking place in China is given by the following abstracts from an article by Li Hson, of the Institute of Metals Research, Peking. The article was published in Scientia Sinica, Vol. VIII, No. 12, 1959, *and the translation has been made available by Mr. R. Sewell.*

Fluorine-containing Iron Ore

SOME Chinese ores contain fluorspar as well as rare earth minerals and this is unique so far as is known. Experiments have been carried out to lower the fluorspar content and at the same time obtain rich concentrates. Magnetic separation and flotation, magnetic roasting, followed by magnestic separation and flotation and reverse flotation were all three used. The concentrates produced contain over 60 per cent. iron, less than 1 per cent. fluorine with an average recovery above 80 per cent. It was found in the blast furnace that most of the fluorine in the ore or concentrates enters the slag, thus lowering the melting point and viscosity of the slag.

Fluorine showed no appreciable effect on the partition coefficient of sulphur between the liquid iron and the slag and when slags of higher (no details given) basicity were used there was a corresponding reduction of sulphur and silicon in the iron.

As regards attack on blast-furnace lining by fluorine-containing furnace gases, the behaviour of fluorine compounds was found to be rather complicated. As the fluorspar in the ore burden descended to certain furnace levels, the temperature of which was about 1,000 deg. C., hydrolysis occurred rapidly with the formation of hydrogen fluoride which mixed with the ascending furnace gases. When the furnace gases had reached the top zone where the temperature was fairly low, hydrogen fluoride was absorbed by lime or limestone in the furnace burden and was carried downward again. As this fluorine-containing burden descended and reached the zone of slag formation, the fluorine compounds rapidly entered the slag and then, with a further increase in temperature, some of the fluorine compounds volatilized and again mixed with the ascending furnace gases. This produced a very irregular effect on the blast-furnace lining. At 500 to 900 deg. C., with furnace gases containing less than 0.1 per cent. HF, the effect was negligible. The attack on the refractory lining by fluorine-containing slag increased with temperature according to an exponential law and, in the case of molten slag containing less than 10 per cent. fluorine, its attack upon the refractories was reduced with increasing alumina content in the refractories.

Attack by fluorspar on alumina bricks was appreciable only when the temperature reached 1,200 deg. C. or above. In large blast furnaces it was shown that high alumina bricks are not good enough to withstand the attack of the fluorine-containing molten slag and carbon bricks should be used.

Copper-containing Ores

In dealing with a certain copper-containing ore copper oxide was sulphatized by means of fluidized bed techniques and was then wet extracted. The copper in solution was replaced by iron and the recovery obtained was about 80 per cent. Another method of treating copper-containing ore was chloridining roasting, whereby 90 per cent. of the copper could be extracted by volatilization.

High-phosphorus Ores and Side-blown Converters

There is a wide variation of phosphorus in Chinese iron ores and considerable attention has been paid to the development of side-blown converters which are adaptable to low-pressure blowers. It is now possible to make steel from pig-iron containing 0.2 to 1.6 per cent. phosphorus.

Alumina Refractories

As China is rich in alumina resources, much attention has been paid to the development of high-alumina bricks. These have been used for electric-arc furnace roofs and have given campaigns several times longer than those with silica roofs. To improve the quality of alumina bricks the sintering processes were improved and it was found that the amount of secondary mullite played an important part during sintering. Small amounts of iron oxides or titanium oxides accelerated the process of alumina brick sintering.

Alumina-magnesite bricks have been developed to replace chrome-magnesite bricks for open-hearth roofs (to save chrome ores). With alumina-magnesite bricks, the campaign of medium size (not stated what size) fixed open-hearth furnaces was 623 heats and that of large tilting furnaces more than 520 heats. These results compare favourably with those obtained with chrome-magnesite bricks. Much research has been done into improving the quality of alumina-magnesite bricks by modifying manufacturing techniques, and investigating changes in constitution and causes of failure during service.

Improved Blast-furnace Operation

The main cause of the improvement in blast-furnace smelting in China was not so much a combination of measures such as improved raw materials beneficiation, use of self-fluxing sinter, high top pressure, etc., but to the adoption of high-

temperature blast. Blast furnaces at Ben Shi Anshan and Taiyuan have all been running with blast temperatures of 1,000 deg. C. A few years ago it was generally admitted that intensification of blast-furnace smelting should not exceed certain limits and these were adhered to without question. This was because an increase in the intensification of smelting was usually accompanied by an increase in the coke ratio. The real key to the change in thought was the concept that " in blast-furnace operation, provided that the increase of volume and temperature of blast is commensurate with the permeability of the burden, smooth running presents no problem."

Open-hearth Furnace Improvements

Apart from the use of chrome-magnesite or alumina-magnesite roofs, water cooling has been replaced by steam cooling and new methods have been used for burning in bottoms. By using thick layers of magnesite impregnated with iron oxide, burning-in time has been greatly reduced.

Chinese investigations have shown that (1) FeO dissolved in MgO formed continuous solid solution in a relatively short time and at comparatively low temperatures, promoting grain growth and therefore eliminating porosity of the sintered magnesite; (2) in oxidizing atmospheres the formation of MgO Fe_2O_3 also promoted the grain growth of magnesite and diminished its porosity. Consequently, furnace bottoms burned in by the above method were more satisfactory.

Tapping Techniques:—The use of double and triple tapping spouts is common. With this method a 945 sq. m. hearth furnace has been charged up to 660 tons.

Arc Furnaces

The Chinese have found that the use of high-alumina bricks have prolonged roof campaigns in arc furnaces. With top-charged arc furnaces, an extra furnace body is always provided to save repair time.

Use of Oxygen:—(*a*) The working load of arc-furnace transformers has been increased by 30 per cent. by cooling the transformer windings by means of enforced oil circulation. As the depth of furnace bath was thus increased by overcharging, oxygen was injected to step up bath temperature. (*b*) The use of oxygen in arc furnaces has cut down the melting period by 15 to 20 min. and the use of coal gas mixed with oxygen has shortened the melting period by half an hour. With the injection of sufficient oxygen, dephosphorization has been accomplished at the end of the melting down period and the boil could, therefore, be shortened.

Duplexing Methods:—The Chinese are making quality steels by mixing open-hearth and electric-furnace heats, side-blown converter and arc-furnace heats.

Continuous Casting in China

Continuous casting research began in China a few years ago and some laboratories already had casting machines of the vertical type for producing billets up to 8½ by 8½ in. at withdrawal speeds of 20 to 200 in. per min. An interesting thing is, that, in order to reduce costs, the Chinese have tended to develop horizontal (inclined) types of continuous casting machines. The Chinese already have a satisfactory horizontal continuous casting machine for producing a 4-in. by 4-in. billet. The mould is inclined 30 deg. to the horizontal. This machine is being prepared for industrial production (the article does not state where it is located).

Rolling

Among development features in rolling are:—(*a*) The adoption of heavy passes; (*b*) double ingot blooming; (*c*) rolling of several bars simultaneously down to 6.5 mm. dia. with improved design of repeaters and entry guides.

Development of Steels

Chinese alloy steel standards published in 1958 were based on Soviet standards. Since the exploration and development of nickel and chromium resources in China will have to wait for a number of years, the rapid increase in Chinese steel production means that for the present alloy steel quality must be related to the available raw materials. Much work has, therefore, been done on the replacement of nickel and chromium.

Experience of the German Democratic Republic has been used and Chinese standards for alloy steels now cover the following nine items:—Constructional alloy steels; high-strength low-alloy steels; alloy tool steels; high-speed tool steels; stainless steels; heat-resisting, scale-resisting steels; low-alloy rail steels; ball- and roller-bearing steels; spring steels.

In the constructional alloy steels, nickel and chromium have been replaced by manganese, silicon-manganese, manganese-vanadium, and boron steels. High-strength, low-alloy steels are based on silicon and manganese, but a few contain small amounts of copper, aluminium, and titanium. Silicon and molybdenum have been used to replace part of the chromium in high-speed steels. Ball-bearing steels are being developed with low chromium content by using silicon and manganese.

In the stainless steel field, attention has been paid to developing ferritic stainless steels and the adoption of austenitic steels without nickel. The possibility of improving their corrosion resisting properties by additions of other alloying elements are being investigated. The development of sandwich steel plates instead of conventional stainless steel plates is being promoted.

A feature of the development of heat-resisting steels has been the ferritic or pearlitic type with improved high-temperature properties obtained by readjusting the composition of chromium-molybdenum-vanadium steels and the Chinese have developed a steel which " lasted more than 700 hr. at 580 deg. C. under a load of 35 kg./sq. mm." (22 ton/sq. in.). To save chromium in heat-resisting steels, the surface of low-carbon tungsten-

chromium-vanadium steel has been coated with hard chromium and this has been used for steam turbine blades.

Reducing Segregation in Large Rimming Steel Ingots

The Chinese are using an unconventional method which they claim is effective in reducing the segregation in large rimming steel ingots. They inject oxygen or compressed air into the top of the ingot while it is solidifying in the ingot mould. This greatly reduces the segregation of sulphur, phosphorus and carbon. It was found to be better than the conventional capping method, which suppressed rimming reaction during solidification.

Deoxidation in the Arc Furnace

In producing ball-bearing steels, initial deoxidation is affected by ferro-alloy and this is followed by the production of a reducing slag. This has lessened non-metallic inclusions by more than 50 per cent. and has shortened the reducing period to 50 min. Calcium carbide has been used directly for making reducing slags.

Ghost Lines in Alloy Steels

By improving the method of deoxidation and ingot mould design, and by means of certain procedures in mechanical working, ghost lines in certain constructional alloy steels were completely eliminated. Ghost lines in high-chromium steels were completely eliminated when melting and casting were carried out in a vacuum of 30 mm. mercury.

Effect of Supersonic Treatment on Grain Refinement

The Chinese have applied vibration casting to chromium-nickel-vanadium steels and have "eliminated branch crystals." A supersonic generator of 50 kW capacity and 20,000 Hertz frequency was used, and useful preliminary research results have been obtained as regards gas removal, grain refinement, and the elimination of carbide segregation in ingots.

Head Wrightson Tube Mill Order

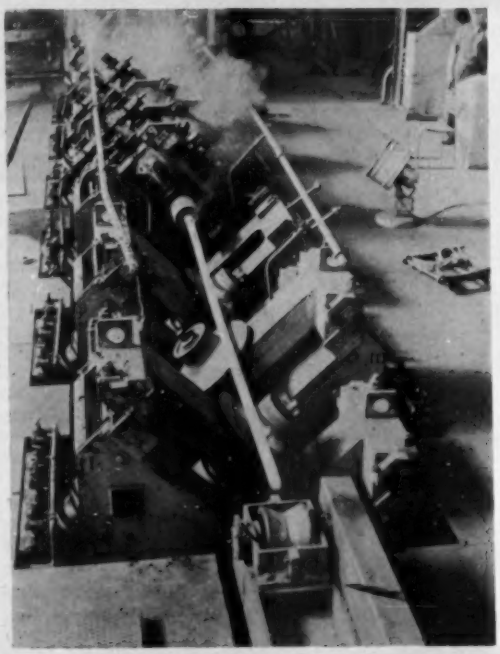
SEAMLESS tube mill to be supplied by the Head Wrightson Machine Company, Limited, Middlesbrough, to Tubes, Limited, Desford (Leics), a member of the Tube Investments group, consists of specialized equipment for producing hot finished alloy steel tubes between 2 in. and 6 in. outside diameter to very close tolerances. The tubes will chiefly be made in those grades of steel used for the production of ball- and roller-bearing races, but the mill is also equally suitable for making medium- and thick-walled tubing in low- or high-carbon steels for a variety of other purposes where accuracy is important.

The mill equipment consists essentially of a billet piercer, a three-roll cross rolling mill or elongator, an 11-stand tube reducer, and a rotary sizer. Very close guiding of the bloom and plug bar at the piercer is an important feature which contributes to the high degree of concentricity of the pierced product.

The elongator rolls the pierced billet over a mandrel bar, which controls the inside diameter of the tube. Adjustment of the three rolls in a radial direction enables a range of wall thicknesses to be produced with a given mandrel diameter. After removal of the mandrel bar and re-heating, the tube passes through an 11-stand tube reducer, where it is reduced in outside diameter without substantially changing the wall thickness. This operation tends to produce a slightly oval tube and it is, therefore, passed through a rotary sizer to ensure a round outside diameter and to correct any slight diameter variations.

After leaving the rotary sizer the tube is fed to a cooling bed.

The main drive motors for both the piercer and elongator are of 2,000 h.p.; the 11-stand tube reducer is driven by twin 350-h.p. motors, and the rotary sizer by twin 100-h.p. motors. The order, which is valued at approximately £800,000, follows a previous order for a similar mill.



VIEW OF EXIT END OF 11-STAND TUBE REDUCING MILL.

QUALITY OF STEEL TUBES AND WELDS

NON-DESTRUCTIVE methods of testing applied to tubes and welds formed the subject of a well-illustrated paper by J. S. Blair, D.Sc., of Stewarts and Lloyds, Limited, presented at a symposium on "Internal Steel Quality and Methods of its Assessment" arranged by the West of Scotland Iron and Steel Institute. An abstract of the paper is given below.

While it is true, states the author, that internal defects in any material can always be found by cutting the material open, this is hardly a satisfactory method. What is required is some means of testing that will determine the presence of flaws from the outside of the material, and in recent years non-destructive testing has been developed to carry out this type of inspection. While such testing is applicable to almost any type and shape of product, this paper is primarily concerned with assessing the internal quality of steel tubes and welds, particularly those in welded tubes.

Detection of Hidden Flaws

Non-destructive testing in general covers a wide field, including the detection of surface flaws, but the paper deals only with flaws in the actual thickness of the material that are not evident to the eye, whether aided or not.

Although there are many methods of non-destructive testing at present in use, four only are dealt with, though in considerable detail. They are:—Radiography; ultrasonic methods; eddy current methods, and methods using diverted magnetic flux. These are generally well known and the flaws can usually be seen, and appreciation of the effectiveness of each method. Each method has its own particularly useful field of operation.

Radiography.—Where thick material having deep-seated flaws, blowholes, and so on, is concerned, X- or gamma-rays probably give the best indication of their presence. An X-ray photograph has the merit that the actual shape and location of the flaws can usually be seen, and appreciation of their extent obtained. Moreover, a permanent record is available. But very small flaws particularly fine cracks are difficult, if not impossible, to detect by radiography, and these in certain circumstances may be quite serious.

Ultrasonics.—Ultrasonics, on the other hand, will detect fine cracks and flaws, but the location and interpretation of the cathode-ray display or of the signal obtained from the ultrasonic apparatus presents considerable difficulty, and requires great experience. It also takes quite a long time to do a thorough examination. Against this, if the type of flaw likely to be encountered is known, the ultrasonic equipment can be used as a production check by arranging that only this type of flaw is indicated, and that such indication operates a marking device on the tube so as to select automatically those tubes requiring further examination.

Eddy-current Method.—This method also is particularly suitable for production work. It can be operated at high speed, and can be set to detect flaws of more than a certain depth or extent and to ignore others, though in practice it is used particularly for defects that break the external surface.

Diverted-flux Methods.—These methods are useful both as production and inspection tools, but are somewhat time-consuming, particularly if very small defects have to be detected.

While all these methods find flaws and defects, there is rather more doubt as to how accurately the size or extent of the defect can be determined, particularly with production-type devices. Allowances can be made for this, but even when all this is done it is questionable whether the alleged extent of a defect is really accurately determined in every instance, though undoubtedly such testing will reveal more defects than would be visible with no testing at all.

This objection applies to some extent to all the methods, though it is more particularly applicable to the eddy-current and diverted-flux methods. Inevitably, judgment, skill and experience are required in interpreting any of the results of such tests. It is as well to issue a word of warning in another respect, namely, that all non-destructive testing costs money, and at the moment there is rather a vogue for such testing whether it is really necessary or not. It would seem that we must ask ourselves very definitely whether in the past the product has given adequate service without such testing, and whether it is now necessary to apply such costly testing merely to prove that the material is still as good.

If the product is to be used for a different or more arduous duty, or if the consequences of failure are very serious, there is some point in going to the trouble and expense of this additional testing. It may be that the slight suspicion that still attaches to welding may be dissipated by the knowledge that some form of non-destructive testing has been applied. One of the dangers of non-destructive testing of the ultrasonic or eddy-current type is that it can be made so sensitive that practically no pipe would be passed by it as 100 per cent. sound. The minute defects which such testing reveal are in most instances quite negligible, but there is great difficulty in deciding what degree of defect warrants rejection. While non-destructive testing is a useful tool in developing better methods of production, it would be a pity if it were insisted upon by inspection bodies to such an extent that it rejected tubes or material of a type which had previously never caused trouble. On the other hand, if it be confined to those cases in which it is really necessary, or where the consequence of failure is very serious, the extra cost is justified.

FEWER ACCIDENTS IN DURHAM MINES

DIVISIONAL INSPECTOR'S REPORT

OUTSTANDING feature during 1959 in the Durham Division of the Mines Inspectorate was the extremely small number of fatal accidents, states Mr. W. Widdas, HM Divisional Inspector, in his annual report under the Coal Mines and Quarries Act, 1954 (Stationery Office, 3s. 6d.). Seventeen fatalities occurred last year at National Coal Board mines; there was one fatal accident at a licensed mine. The 1958 total was 46. all of which occurred at NCB mines.

In recent years there has been a steady increase in the number of persons killed by falls of ground at the working face and a marked decrease in the number of fatal accidents caused by haulage. The figures for persons seriously injured show a small decrease in all categories except in falls of ground on roads and in haulage. Last year was the first year since 1947 that no fatal accident occurred to young persons, but the number of youths seriously injured underground has more than doubled when compared with figure for 1958, the inspector states.

Accidents from falls of ground represented 42.9 per cent. of all killed and seriously injured. Fourteen persons were killed by falls of ground during the year, compared with 19 in 1958 and an average of 20.3 over the past three years. Accidents involving serious injury amounted to 79, compared with 68 in 1958 and an average of 58.3 over the past three years. The fatal accident trend has been consistently downward, but the number of persons seriously injured has steadily increased. The actual number of serious injuries reported from the working face area last year was the same as in 1958, but those reported from the roads have risen from eight in 1958 to the high total of 19 last year.

Danger of Cauldron Bottoms

Many of the accidents caused by falls of roof occurred where abnormal conditions were present. Cauldron bottoms or potholes were the cause of at least three accidents. It is difficult to guard against these because the base perimeter is not easily seen until some roof movement has taken place when, because their sides are smooth and taper inwards, they are liable to fall. The size of these cauldron bottoms vary considerably; thus, no systematic setting of supports can be sure to cater for all. The inspector emphasizes that it is for everyone to exercize care on faces where it is known that cauldron bottoms are present.

Faulting and preformed breaks from old workings in seams above and below resulted in falls of roof. The majority of persons are fully aware that extra precautions are required where faults and breaks are known to be present and it was unfortunate that one fatal accident occurred when two men were actually setting extra supports at a fault.

It has been said that an abnormality on a face becomes the normal condition; the inspector therefore stresses that managers should consider such faulting and set down guidance in their Support Rules.

Danger at Roadheads

There were five fatal accidents and 26 involving serious injury in the roadhead area, compared with six and 20, respectively, in 1958. Unlike other categories, falls in the roadhead area have shown a gradual increasing trend. Everyone from the manager downwards must recognize that the roadhead area is where the greatest concentration of activity occurs on a working face. Every man who goes on to a longwall face must pass a roadhead and often heavy machinery is concentrated at one or more roadheads on each face. Again, by the very nature of the purpose of a roadhead, the strata has to be broken in order to make an adequate roadway for ventilation, transport, and travelling; extreme care must thus be taken in the design of the support system and its application.

There was one fatality and three persons were seriously injured by falls of roof in wastes, compared with two killed and four seriously injured in 1958. This improvement is a continuation of the trend over the past few years and the inspector feels sure that the introduction of props which can be unloaded and shortened by remote action has had a considerable bearing on safer withdrawal.

Accidents by haulage and transport resulted in 32.2 per cent. of all killed and seriously injured. Two persons were killed and 68 seriously injured, compared with 15 killed and 61 seriously injured in 1958. The remarkably low figure for the fatalities is welcomed, but the increase in the number of serious injuries is disappointing.

In the category of accidents due to miscellaneous causes one person was killed and 27 seriously injured, compared with one and 26, respectively, in 1958. These accidents represented 12.9 per cent. of all killed and seriously injured.

Twenty-two persons were seriously injured in surface accidents, compared with seven killed and 27 seriously injured during 1958. This decrease, particularly in the fatal accidents, must reflect credit on management and men alike for the safer work-

ing conditions on the surface. It is considered that the surface tidiness campaign has had a bearing on this achievement.

Fatal accidents and those causing serious injury are summarized in Table 1.

TABLE 1.—*Persons Killed or Seriously Injured in Coal Mines in Durham during* 1959, *Compared with Average for* 1956-58.

Classification of accident.	Killed.		Seriously injured.	
	1959.	Average, 1956–58.	1959.	Average, 1956–58.
Underground:				
Falls of ground—				
(*a*) Roof at face ..	7	9.4	21	19.7
(*b*) Face or side ..	—	0.7	10	12.0
(*c*) Other falls elsewhere	7	10.2	48	26.6
Haulage and transport ..	2	10.0	68	62.6
Miscellaneous causes ..	2	5.7	30	38.4
Total underground ..	18	36.0	177	159.3
Surface	—	5.3	22	22.7
Total	18	41.3	199	182.0

There were 3,519 horses employed in the mines in the division last year, a reduction of 558 on the previous year.

Coal Straight from Pithead to Power Station

AGECROFT "B" power station, at present supplied with fuel by lorry from various parts of the Lancashire coalfield, will next year have its coal delivered by conveyor belt from a new colliery across the road—eventually, perhaps, as much as 2,000 tons a day will be transferred. When the new Agecroft Colliery comes fully into service in 1962, its daily output will be something like 4,000 tons. After processing, coal will be delivered by conveyor belt to the power station.

Only men, and material used for stowing underground, are being wound in the new No. 5 shaft, but eventually it will be used for coal winding as well. The four-deck cage in this shaft holds 144 men, and at a winding speed of 41.7 ft./sec., 528 men can be brought to the pithead from a depth of 1,925 ft. in half an hour.

The friction winder in this shaft is driven by a 2,500-h.p., 530 r.p.m. motor, supplied by Associated Electrical Industries, Limited, which takes its direct-current from grid-controlled mercury-arc rectifiers—the first installation of this type in Lancashire.

Welding Research

Welding, today, frequently involves using new materials and working to standards which were inconceivable only a few years ago. The net result is that, apart from maintaining a large "minimum" programme of work, the British Welding Research Association is increasingly being called upon to meet specific problems in design, in selection of welding conditions, and in the choice of materials. The 1959-60 annual report of the association, in referring to the need to increase its income solely on the basis of present commitments, points out that a programme more than double the size of the current one already exists.

Cantilever Bars on Prop-Free-Front Faces

RESPONSIBLE for the development of a device to assist in the erection of cantilever bars on prop-free-front faces is Mr. R. C. Woodman, a deputy at Penallta Colliery, No. 5 (Rhymney) Area, South-Western Divisional Coal Board. The device, which saves manpower, gives added safety, and is cheap to make, has been used at Penallta for over eight months and has given very satisfactory service.

At Ogilvie Colliery, in the same Area, six are in use on a plough face; officials and workmen alike have been so pleased with results that six more are to be made for work on this face.

Mr. Woodman's invention, designed to assist in the erection of Vanwersch roof bars, consists of a pipe and lever. The 1-in. dia. mild-steel pipe is of a length to suit the support stipulation of "distance between alternative bars." In the Penallta installation this is stated as being 4 ft., so the pipe has been designed 4 ft. 6 in. long. A hook is welded to one end of the pipe, while the other is belled. A similar hook of ½-in. round mild steel is free to be moved along the length of the pipe, but is retained on the pipe by the belled end.

The lever, which has serrated edges, is made from ½-in. round mild steel.

Without the invention, two men are required to erect the bar when the seam section is low, one man holding the bar to the roof while the other secures it, and the conveyor has to be stopped. With the invention, it is no longer necessary for men to be astride the conveyor, so that they do not have to encounter the danger of being under an exposed roof, while the chance of injury to men due to inadvertent starting of the machine is also eliminated.

When enough roof is exposed to require the extension of a bar in cantilever on to the roof, the forward jaws of the bars on either side are situated approximately along the centre line of the panzer conveyor. The pipe is suspended by hooks from the two bars. The bar to be erected is lifted on to the pipe, the mate end of the bar located in the jaw of the standing bar and the hinge pin located. With one hand the propsetter uses the lever to raise the bar against the roof, while the other hand is used to locate the locking pin and hammer it into position. As the panzer machine does not have to be halted for the erection of bars, there is more ploughing time—the time saved representing an increase in output of as much as over 50 tons per shift.

DR. W. J. KROLL, of Corvallis, Oregon, USA, will deliver the Castner Memorial Lecture of the Society of Chemical Industry under the title. "The Fusion Electrolysis of Titanium", on October 7, at the Royal College of Science and Technology, Glasgow.

Spring-suspended Open-hearth Roof

FLEXIBILITY REDUCES REFRACTORY WEAR

A spring-suspended open-hearth roof of magnesite-chrome refractories has recently completed a campaign of 306 heats at a US steelworks, a complete rebuild then being necessary. Particulars of the roof design and of its behaviours are reported in Steel (July, 1960). An abstract from the article is given below.

AS will be seen from Fig. 1, the roof is designed to function as a conventionally sprung arch, the lifting mechanism eliminating excessive pressure in the arch structure which, if uncontrolled, would cause deformity of the roof contour. Pivoted beams anchored at the front wall and backwall buckstays are connected above the centre or crown of the roof by overlapping plates with slotted holes. The beams can rise or fall as a unit, but not individually.

Coil springs, supported by channels on the original furnace binders, are connected to the floating beams by threaded rods. Pipes, 3-in. dia., are suspended from the beams by U-bolts, bent rods being hooked over the pipes to support metal-encased roof bricks. The coil springs are designed and adjusted to carry 40 per cent. of the centre two thirds of the roof, as well as the floating beams, pipes, and rods, that amount of lift being expected to reduce pressure in the arch at the skew line to about 25 per cent. of the pressure in a conventionally sprung roof. Theoretically, spring adjustment should not be necessary during the life of the roof.

As it continues to rise, it is expected to lose weight, the springs extending and continuing to give the right amount of lift in relation to weight.

Refractories are similar to those used on Russian basic roofs, consisting of burned, magnesite-chrome, metal-encased bricks, the mix being about 70 per cent. magnesite. The main roof of the furnace in question was made of 12-in. by 4½-in. by 3-in. bricks, 13½-in. by 4½-in. by 3-in. bricks being used on the slopes. The metal casing of the bricks extends 1½ in. above the large end, two holes being punched in the extended portion on the 3-in. side to accept suspension rods.

During the campaign the roof was cleaned weekly by compressed air, partly to facilitate measurements taken to plot roof movement. Some spalling occurred during 147 heats made before the 1959 steel strike; at about 100 heats, the roof began to rise in a dome pattern near the oxygen lance openings. The area between the openings was also rising. Roof rise in local areas caused some support rods to part from the pipes 1 in. to 3 in. and a crack appeared between the lance holes. Springs supporting the outer portion of the roof were tightened to raise the low spots and longitudinal members of the supporting structure were also modified to make them more flexible. Most of the high areas receded and the separation between the lance openings closed slightly. But the domes around the openings continued to grow.

The roof required no patching when the furnace was put into operation after the 1959 strike. Inspection revealed that bricks were 9 in. to 10 in. thick at most points, but slightly thinner around the lance openings. Springs were tightened again to compensate for loss of contour. Areas around the lance openings continued to rise slowly until about 210 heats. Then the refractory material seemed to stabilize and the rate of rise decreased noticeably. The furnace ran a campaign of 306 heats, with no lost time for roof repairs, but worn end walls made a rebuild necessary. The original supporting structure was, however, used for the new roof.

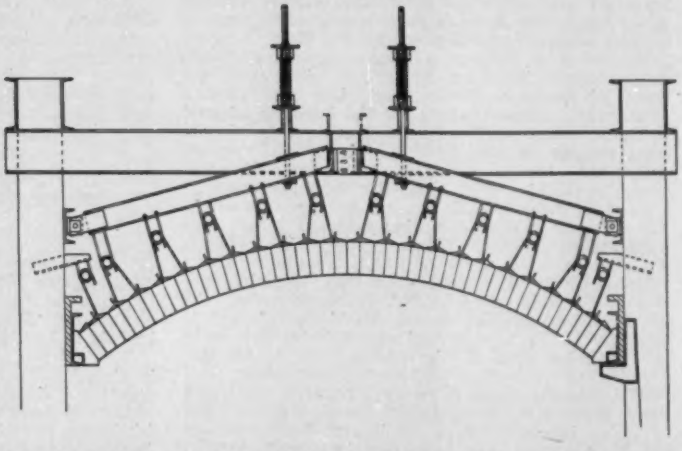


FIG. 1.—PIVOTED BEAMS ANCHORED TO THE FRONT WALL AND BACK WALL BUCKSTAYS ALLOW THE ROOF TO MOVE UP OR DOWN, COMPENSATING FOR TEMPERATURE CHANGES IN THE FURNACE.

New Literature

NEW catalogues, booklets, and other publications which have recently been received include those mentioned below. Readers wishing to obtain a copy of any of the publications referred to should apply direct to the address given, at the same time mentioning IRON AND COAL.

RANSOMES & RAPIER, LIMITED, Waterside Works, Ipswich—RapieR horizontal drum truck mixers and agitators are the subject of a new brochure.

MATBRO, LIMITED, Fork Truck Division, Horley (Surrey)—Brief details about the Matbro Series III range of forklift trucks are contained in a new brochure.

STANTON IRONWORKS COMPANY, LIMITED, near Nottingham—The Stantonian, the August number of which is to hand, maintains its usual high standard of presentation of news of personnel at the company's works.

BROOK MOTORS, LIMITED, Huddersfield—The Brook range of British Standard drip-proof electric motors can now be supplied with epoxy resin encapsulation of the end windings and slots. Details are given in list 905.

MORGAN REFRACTORIES, LIMITED, Neston, Wirral (Ches)—The company has recently developed a new range of pure oxide refractories, to which has been given the generic name "Purox." They are described in leaflet RD.95.

JOHN HOLROYD & COMPANY, LIMITED, Milnrow (Lancs)—The Holroyd News Letter (a duplicated newssheet) for August contains notes on a new type of helical gear being made in the Soviet Union, together with other interesting items.

BELMOS COMPANY, LIMITED, Bellshill (Lanarkshire)—Leaflet PB 25:10 describes the air-break electromagnetic contactor Type B.150, the main application of which is for direct-on-line starting of motors up to approximately 600 h.p. at 3.3 kV.

BROKEN HILL PROPRIETARY COMPANY, LIMITED, Melbourne, Australia—Less than four miles from the heart of Brisbane, the company has established a modern and efficient wharf for the handling of steel products. The wharf is described in an article in the June number of the B.H.P. Review.

GLACIER METAL COMPANY, LIMITED, Alperton, Wembley (Middx)—First issue of "The Plain Bearing," a quarterly digest of activities and developments within the company, makes interesting reading. It has four pages, is in newspaper format, and consists of short notes and articles, many of which are illustrated.

EDGAR ALLEN & COMPANY, LIMITED, Imperial Steel Works, Sheffield 9—A simple explanation of the principles and practice of the machining of steel is given by Dr. F. C. Lea and Mr. Eric N. Simons in the September issue of Edgar Allen News, which also contains several other technical contributions.

INCANDESCENT HEAT COMPANY, LIMITED, Cornwall Road, Smethwick, Birmingham—Leaflet FP.3, a most attractive brochure, gives details of the company's hot blast system. It may also be noted that an Austrian foundry producing radiators and central-heating systems is about to install an Incandescent hot blast heater. It will supply 3,000 standard cu. ft. of blast air a minute at 500 deg. C. for a pair of 6-ton/hr. cupolas.

MARTONAIR, LIMITED, Parkshot, Richmond (Surrey)—The Journal of Applied Pneumatics, published by the company, costs 1s. 6d. The latest issue contains articles, all well illustrated, on "Drum Setting and Rimming," "Broaching of Composing Machine Components," "Foundry Machinery," and several other subjects.

PYE TELECOMMUNICATIONS, LIMITED, Newmarket Road, Cambridge—Newsletter, the July issue of which has recently been published, is a readable and well-presented magazine, "published to promote and encourage interest in the latest developments in communication introduced by the company and users of Pye equipment."

PYRENE COMPANY, LIMITED, Metal Finishing Division, Great West Road, Brentford (Middx)—The new Parker 45 finishes (P.45B and P.45C) are quick air drying stain materials which are applied at room temperatures by dip or spray and are intended for use on "Bonderized" or "Parkerized" surfaces. They are described in a pamphlet just issued.

DAVID BROWN CORPORATION (SALES), LIMITED, Tractor Division, Meltham, Huddersfield—Since its foundation 100 years ago the David Brown organization has fulfilled a unique role in the technological advancement of human endeavour in many parts of the world. A bright and readable brochure outlines the organization's more spectacular contributions.

ELECTRIC RESISTANCE FURNACE COMPANY, LIMITED, Netherby, 161, Queens Road, Weybridge (Surrey)—For some time now all the rolling-mill pinions at the Darnall Works of the Davy & United Engineering Company, Limited, have been case-hardened in EFCO gas-carburizing plant. An article on the Davy-United plant is the main feature of the August number of the EFCO Journal.

E. I. DU PONT DE NEMOURS & COMPANY, Wilmington, Delaware, US—A model coal mine in West Virginia, which is equipped with the most advanced mining machinery, uses neoprene conveyor belts as a basic mining tool. The belts link the production chain and provide a new standard of durability and service. The July-August number of the Du Pont Magazine carries an article on the subject.

Steels for Reactor Pressure Circuits

AS a contribution to the activities of the British Nuclear Energy Conference, of which it is a member, the Iron and Steel Institute is arranging a symposium on "Steels for Reactor Pressure Circuits," to be held in London from November 30 to December 2.

Some 20 papers giving the results of recent research in Canada, Great Britain, and the US are to be presented and discussed during the meeting's five sessions, which will cover high-temperature properties, corrosion, fabrication aspects, irradiation effects, and steels for future reactors, respectively.

Details may be obtained on application to the secretary of the Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1.

ECSC Steel Output

BIG RISE IN AUGUST PRODUCTION

CRUDE steel production in the European Coal and Steel Community in August, which totalled 5,960,000 metric tons, was 17.6 per cent. higher than the corresponding month in 1959, according to figures issued last week by the ECSC High Authority. Production in West Germany was higher than in any month since the opening of the Common Market. But in three countries—France, Italy, and Luxembourg—production was the lowest this year, due to the holiday period.

In the first eight months of the year steel production in the Community was 19.4 per cent. higher than in 1959. The largest increase was in Italy—almost 30 per cent. higher than in 1959—and in West Germany output was 20.3 per cent. higher.

Pig-iron production in the same period was also 20.2 per cent. higher than in 1959, with the greatest rise again marked in West Germany and Italy. In August, German pig-iron production was an all-time record, and the Community total was 4,560,000 metric tons as against 3,850,000 tons in August, 1959.

Steep Rise in Orders

Orders for rolled steel received by the ECSC ferrous metals industry in July totalled 4,620,000 metric tons. This compares with orders of 4,200,000 tons in the previous month and 4,460,000 tons in July last year. Orders from non-member countries of the Community reached a new record level over the month. Steel producers in West Germany, France, and Italy recorded a particularly steep increase in orders received, while those in the Benelux countries experienced a slight fall-off in orders. ECSC order-books remain very full, the increase in orders received being even steeper than the sharp rise in production and deliveries of rolled steel. Total order-book of the Community at the start of June is given as 13,500,000 tons. The buoyant steel demand is expected in Luxembourg to continue in the second half of this year.

The High Authority, at present engaged in the resetting of its policy aims in coal, steel, and scrap, is planning to float a $50,000,000 loan on the American capital market with the help of an American consortium made up of United States banks. A final decision is expected to be taken in Luxembourg later this month. Belgian and Italian firms are to be the main beneficiaries from such a loan, the West German Government having stated its lack of interest in the project. Money thus raised and not taken up in standing credit claims is expected to be used for the settlement of new industries near to closed mines.

Four leading German steel producers, August Thyssen-Hütte, AG, Bochumer Verein, Dortmund-Hörder Hüttenunion, and Bergwerke Rheinhausen, have placed new price lists for semi-manufactured steel for rolling before the High Authority. The prices of most main types are lower by between 3.9 per cent. and 5 per cent.

Strong protests from West Germany's steel industry have been provoked by the news that the country's Federal Ministry of Labour is planning a Bill to stop continuous operation of Siemens-Martin, electro-steel, and Thomas steel works by the imposition of Sunday working bans. The Ministry plans an eight-hour halt period with neither work nor repairs for the continuous-production Siemens-Martin and electro-steelworks, and a 16-hour halt in production or repairs in Thomas plants, where Sunday is at present shared between production and repair and maintenance work.

The steel producers state that although only some 17,000 workers would be affected by such a ban, it was unfair that they should be subject to the ban while 33,000 workers in blast furnaces, rotary steelworks, and furnace coking plants worked as normal on Sundays. The employers assert that it would be virtually impossible to keep to the 42-hour week if continuous working were stopped. The repairs ban is termed illegal by the industry's spokesmen, and it is planned to draw up an expert's report on this matter. The introduction of the plan, it is stated, would lead to a loss of 10 per cent. of total raw steel production.

£2,500,000 Steel Plant Orders for Head Wrightson

ORDER for a complete sinter and gas cleaning plant for the Ravenscraig works of Colvilles, Limited, together with a contract for special rolling stock for Richard Thomas & Baldwins, Limited, together worth about £2,500,000, have been received by Head Wrightson & Company, Limited.

The work will be undertaken by two subsidiary companies, Head Wrightson Iron & Steel Works Engineering, Limited, and the largest manufacturing company in the group, Head Wrightson Teesdale, Limited. During the past month the Head Wrightson group has announced orders worth a total of £5,065,000, including the latest contracts.

Dutch Hoogovens' Increased Production

DUTCH iron and steel concern, Koninklijke Nederlandsche Hoogovens en Staalfabreken, NV, announces a production for the first half of the current year of 653,000 metric tons of pig-iron and 782,000 tons of raw steel, compared with 522,000 and 651,000 tons, respectively, for the same period of last year. The financial results of the company are said, after depreciation and tax reservation, to have overtopped considerably those for the 1959 period.

It is stated that the company has bought a 40 per cent. minority holding in the Dutch rolled products and scrap trading firm of Vereenigde Utrechtse IJzerhandel, NV, Utrecht.

Appointments

New Posts at Richard Thomas & Baldwins

NEW appointments have been made at the Ebbw Vale and Spencer works of Richard Thomas & Baldwins, Limited. Mr. W. Brown, education and welfare officer, Ebbw Vale, will become manager, personnel department on the retirement of Mr. Eugene Cross at the end of this month. Mr. J. S. Thomas, productivity engineer, Ebbw Vale, has been appointed assistant manager, productivity engineering department.

Two secondments to RTB from firms of consultants associated with the construction of the Spencer works have been made. Mr. Derek R. R. Dick, a partner in W. S. Atkins & Partners, consulting engineers, has been appointed construction manager, Spencer works, and Mr. E. G. Hoare, of the International Construction Company, Limited, has been appointed plant manager. Mr. Dick has served with the Ministry of Works, and also with the UK Atomic Energy Authority as chief structural engineer. Mr. Hoare was for 16 years ICC's resident engineer with the Steel Company of Wales, Limited, and during his career has been associated with the construction and installation of plants in India, Turkey, Norway, and other countries.

Mr. T. J. HIRST has been appointed works manager, John Lysaght's Scunthorpe Works, Limited, Scunthorpe.

Mr. A. W. THWAITES has been appointed commercial director of Richard Hill, Limited, wire manufacturers, of Middlesbrough. Mr. H. M. MACGREGOR has been appointed works director.

Mr. C. G. ABEL has been appointed general sales manager of Farmer Bros. (Shifnal), Limited, structural engineers, of Shifnal (Salop), a member of the Metal Industries, Limited, group.

Mr. R. H. WEIR, at present director general of engine research and development, has been appointed director of the National Gas Turbine Establishment at Pyestock in succession to Mr. H. Constant.

Dr. JOHN HOUGHTON, head of the Department of Mechanical Engineering of the Brunel College of Technology, has been appointed principal of the Constantine Technical College, Middlesbrough.

E. Boydell & Company, Limited, manufacturers of the Muir-Hill range of dumpers, loaders, and shunters, of Old Trafford, Manchester, has appointed Mr. C. F. HEWLETT as sales representative for the East Anglia area.

Mr. W. E. SMITH, formerly assistant general manager of the ironstone department of the Staveley Iron & Chemical Company, Limited, has been appointed general manager of Richard Thomas & Baldwins (Mineral Recovery), Limited, Wansford, Peterborough.

Mr. STANLEY K. WHEATLEY has been appointed a director of the Sheffield Wire Rope Company, Limited, a member of the Firth Cleveland, Limited, group. He has been 44 years with the firm, the last 15 as company secretary. Mr. Wheatley was appointed an executive director in May, 1959.

Mr. E. H. S. VAN SOMEREN has joined the British Welding Research Association as a principal scientific officer and is to work on fundamental studies on the physics of the welding arc by optical observations. After graduating from London University with a special degree in chemistry, he worked on non-ferrous metals in Birmingham, Copenhagen, and Odda and since 1958 he has been in the research department of Murex Welding Processes, Limited. Mr. van Someren is a member of the Institute of Metals and the Institute of Welding, and a fellow of the Institute of Physics.

Manager of the new plate mill being completed for Consett Iron Company, Limited, Consett (Co. Durham) will be Mr. A. HENDERSON. The assistant managers will be Mr. N. S. TATE, Mr. H. G. WHITE, Mr. R. MORRIS, Mr. W. A. HUMBLE and Mr. T. NETTLETON. Manager of the primary and billet mills will be Mr. J. MCGILLIVRAY, and the assistant managers, Mr. E. THOMPSON and Mr. R. PRICKET.

Mineworkers' Demand over Ebbw Vale Candidate

MINERS' leaders in South Wales expressed resentment on Tuesday over the exclusion of their official nominee, Ald. F. Whatley, from the short list of five to be considered for the Labour candidature in the by-election at Ebbw Vale. They suggested that their objection would be overcome if the original 10 nominees were considered by the selection council of the divisional Labour Party.

The name of Ald. Whatley, a colliery worker, together with four others including Mr. Michael Foot, former MP for Devonport, and that of the official nominee of the steel unions, was rejected last week by the divisional executive committee in the constituency, whose short list included four professional men.

Mr. W. Whitehead, Area president of the National Union of Mineworkers, said: "It was wrong to exclude official nominees of the steel and coal-mining industries, the two largest trade union branches in the division, from whom the divisional party receives its largest financial support." If the miners' candidate were defeated by the whole of the divisional party, the union would accept it as a democratic decision, he said.

The short list has been sent to the National Executive of the party which has power to add to it or object to any of the names it contains.

Coal Industry May Become "Milch Cow"

IN the annual report of the Durham County Mining Federation Board, its secretary, Mr. Sam Watson, maintains that in the absence of a co-ordinated plan for fuel and power it is almost impossible to prevent the coal industry from becoming "the milch cow to feed all other industries with fuel and energy at low prices." "It is agreed," he states, "that such a policy will keep some of our pits open, but by the very nature of this principle this can only be temporary and eventually pressure would mount against prices."

There is no reason, he declares, why the country should not have cheap and plentiful power, but there is every reason why one industry should not become the anvil upon which cheap and plentiful power is hammered out.

TUC Backs Miners

DECENTRALIZATION OF COAL INDUSTRY OPPOSED

RESOLUTION opposing "any attack by the Tory Government on the nationalized industries" and promising support for the mineworkers in their resistance to any attempt by the Government to decentralize control and statutory authority in the coal-mining industry, was carried unanimously by the Trades Union Congress at Douglas, I.O.M., on Thursday of last week. Mr. Will Paynter, general secretary of the National Union of Mineworkers, who moved the resolution, asserted it was the Government's intention to "subordinate the coal-mining industry in the service of private enterprise."

Mr. Paynter said he wished to "enlist the active support of Congress in the resistance that my union will certainly give to any attempt to dismantle or emasculate the content of nationalization in the coal-mining industry." The union had certain knowledge that the Government was now projecting plans to confer on the divisional boards statutory responsibility, both for trading and accounting.

"We are certain that if the eight or nine divisional boards now in existence are given statutory responsibility by the Government to determine their own organization for marketing coal, it must inevitably mean the reintroduction of competition as between coalfield and coalfield, which brought us to ruin in the twenties and thirties," he maintained.

Structure of Coal Board

Mr. Paynter said that this decentralization could lead not only to a breakdown of national agreements, but to the disintegration of the NUM through rivalries and competition set up in the revised form of Coal Board organization. The second prong of the Government's plan, he asserted, was to change the composition and structure of the NCB itself. Except for the chairman and deputy chairman, the rest of the members would be appointed from existing or future chairmen of boards. It was suggested that chairmen of divisional boards and members of them would be appointed by the Minister and be directly responsible to the Minister for the running of the division.

"This projected plan by the Government not only stems from a political philosophy opposed to nationalization and public ownership, but is intended to further subordinate the industry in the service of private enterprise within the economy of this country."

Mr. Paynter said that when questioned in the House of Commons, the Minister of Power, Mr. Richard Wood, has said that the Government had no intention of denationalizing the industry or disrupting existing national agreements. The union was not suggesting that the Government's intention was to denationalize the industry. The plan was being justified on the ground that the industry was facing changed conditions. His reply to this was: "Certainly we are. We do not deny it. But we insist that these changed conditions do not arise from internal deficiencies inside our industry, but as a result of political policies pursued by the Government in relation to our industry."

The industry was carrying a heavy financial burden, created in the post-war years when it had been treated as a public industry which provided private industry with cheap coal. Now it was expected to operate as a commercial undertaking, with such additional burdens as being responsible for the cost of subsidence. Mr. Paynter went on: "The major problem we have to face in this situation is a world overproduction of oil, and the policy of the Government designed to solve the problems of oil monopolies at the expense of the nationalized coal industry."

Other changes were contemplated, he said. Undertakings had been given in Parliament by the Chancellor that capital requirements and loans to nationalized industries would be subject to annual review in Parliament. But, he said, industry must know what capital would be available for the coming five or 10 years. Plans could not be made one year at a time. This was not a problem for the miners. Decentralization was a problem for the whole Labour and trade union movement. There could be no reality in the decision Congress had taken that morning for progressive extension of public ownership, unless they could defend public ownership in the industries where it already existed.

Supporting the motion, Mr. J. Crawford (National Association of Colliery Overmen, Deputies, and Shotfirers) referred to a time when there had been competition in the coal-mining industry between district and district. The result had been that some collieries had to work overtime. This was simply because of district competition in prices. "Leave the miners alone to get on with their job and stop subjecting the industry to an atmosphere which can only lead to frustration and loss of confidence," he said.

Congress earlier carried a motion calling for the extension of public ownership on a selective and progressive basis. It asked the general council to prepare a comprehensive report on the subject. The report is intended as a sequel to the interim report on the subject presented in 1953, when the general council examined many industries, including engineering, machine tools, chemicals, mining machinery, railway equipment and heavy electrical goods. It made a number of suggestions about how the State might intervene, but reached no final conclusions. The new inquiry will occupy the council's economic committee during the next year or two.

Specific industries and sections of industries will be considered and listed, but the committee's approach is to be pragmatic and "flexible." It is recognized that nationalization on the lines of the Coal Board or the Transport Commission would not suit every industrial concern, and that there are other methods of achieving the ends of public ownership or control.

Cutting Production Costs by "Variety Reduction"

USE of "variety reduction" results in lower costs and higher productivity, says a report issued by the British Productivity Council on Monday. Variety reduction, it points out, does not mean restriction of consumer choice, but producing what the customer is willing to buy and eliminating the uneconomic variety.

Fact-finding comes first in the process, with sales of every product charted back over some years. Careful comparison reveals which products are becoming popular and those which are declining. Frequently, this analysis reveals that quite a small minority of the lines sold has produced a major part of the total sales income. Typical figures indicate that as little as 20 per cent. of the product range may be responsible for as much as 80 per cent. of total sales income.

Competing firms within the same industry, the council suggests, might usefully discuss their ranges with each other. Agreement to review and specialize should end uneconomic "knock for knock" lists of identical products in many catalogues. The report explains how variety reduction should be accomplished, and gives examples from 12 leading companies which have adopted the technique, with some of the savings that have resulted. The booklet is obtainable from the council at 21, Tothill Street, London, S.W.1.

Ferro-alloy Prices

(Per ton, unless otherwise stated, delivered)

FERRO-SILICON (6-ton lots and over)—45 per cent. Si, £43 10s. to £46, scale 15s. per unit, lumpy; 75 per cent. Si, £59 to £63 10s., scale 15s. per unit, lumpy.

FERRO-VANADIUM—50/60 per cent., 20s. 6d. per lb. of V.

FERRO-MOLYBDENUM—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

CALCIUM MOLYBDATE—12s. 4d. per lb. of Mo.

MOLYBDIC OXIDE BRIQUETTES—11s. 10d. per lb. of Mo, delivered United Kingdom.

FERRO-BORON—23/25 per cent., 7s. 6d. per lb.

FERRO-TITANIUM—20/25 per cent., 2-3 per cent. Cu, £250; 38/40 per cent., commercially carbon-free, £287.

FERRO-TUNGSTEN—80/85 per cent., 12s. 1d. per lb. of W.

TUNGSTEN METAL POWDER—98/99 per cent., 15s. 1d. per lb. of W.

FERRO-CHROME (6-ton lots and over, lumpy)—4/6 per cent. C, £81 10s. to £84 10s., basis 60 per cent. Cr scale 27s. to 28s. 6d. per unit; over 6 per cent. C, £79 to £82 10s., basis 60 per cent. Cr, scale 27s. to 28s. 6d. per unit; max. 2 per cent. C*, to 1s. 8d. to 1s. 11d. per lb. Cr; max. 1 per cent. C*, 1s. 8d. to 1s. 11½d. per lb. Cr; max. 0.15 per cent. C*, 1s. 9½d. to 2s. 0¼d. per lb. Cr; max. 0.10 per cent. C*, 1s. 9¾d. to 2s. 0¾d. per lb. Cr. max. 0.06 per cent. C*, 1s. 11d. to 2s. 1d. per lb. Cr.

METALLIC CHROMIUM—98/99 per cent., 6s. 10d. per lb.

METALLIC MANGANESE—94/96 per cent., carbon-free, £275; 96/98 per cent., £285.

FERRO-COLUMBIUM—65/67 per cent., Cb+Ta, 19s. 6d. per lb. Cb+Ta.

FERRO-MANGANESE (home)—78 per cent., £61 10s.

* *Average 68-70 per cent. Cr.*

IT IS REPORTED that a plant to produce more steel constructions than all other similar plant in Poland taken together is to be built at Skierniewice, near Lodz. The new works will turn out 49,000 metric tons of bridgework and other steel constructions annually.

EARLIER THIS YEAR the Industrial Welfare Society held two conferences on "How the City Works," for directors and company secretaries. Another modified conference on the same subject for works managers, sales managers, and other senior executives will be held at 48, Bryanston Square, London, W.1, on October 10 and 11.

Ore Chartering

INQUIRY is reasonable, but there is still a good volume of tonnage available. There is some inquiry for tonnage to load from India, but no particular pressure, and recently Marmagoa/Calais paid 40s. 9d. f.i.o. for 9,500 tons September 10/30.

The Mediterranean area is quiet with sombre inquiry from North Africa to the Continent, but generally speaking the inquiry is of a miscellaneous nature. Savona/Newcastle reports 10,000 tons pyrites residues at 23s. f.i.o. for September 20/October 20 and 7,000 tons to Barrow at 25s. f.i.o. for end September with prospects of further business. Phosphate shows some inquiry from Casablanca to this side, and to the Continent, 6,400 tons has been taken for Ghent at 25s. and 9,500 tons to Antwerp at 20s. for September 5/17.

West African ore is not very attractive. There are possibilities to the Continent from Pepel and a report of large tonnage being fixed from Conakry to Gdansk or Gdynia at 28s. f.i.o. for prompt shipment. The Swedish section is quiet and there is apparently nothing quoting on the open market for United Kingdom discharge.

HIGHER HALF-YEAR PROFITS FOR REFRACTORY MANUFACTURERS

NET profit for the first six months of 1960 of Steetley Company, Limited, manufacturers of refractories, of Worksop (Notts), rose from £581,000 to £665,000, after tax of £692,123 (£550,829). The interim dividend is increased to 5 (4) per cent., and it is proposed to divide the £1 ordinary into 5s. shares. The final dividend for 1959 was 10 per cent., making a total of 14 per cent. against the previous equivalent of 11¼ per cent.

The increase in profit for the first half, it is stated, arose from the higher level of activity by principal customers, namely the steel industry, compared with the same period last year. In the second half of last year works were almost fully employed, so there is little scope for any increase in profit in the second half of 1960, it is added.

Minister's Export Drive Tour of Machine-tool Firm

DURING a tour of the machine-tool factory of James Archdale & Company, Limited, at Worcester, on Monday, Mr. F. J. Erroll, Minister of State, Board of Trade, said that apprenticeship was now entering its most important phase. Mr. Erroll, who had been touring the factory in connection with the export drive, was told that the 115 apprentices began making parts for the company's products within two days of entering the firm. About £1,000 a year was spent on sending groups of them to Outward Bound schools.

On his visit to Worcester the Minister said that an all-out drive to stimulate Britain's present exports was essential. The Prime Minister's speech on exports, given to 400 industrialists in July, had resulted in encouraging activity and interest, and many companies and individuals had written to Mr. Macmillan or to the Board of Trade to put forward views and suggestions on how to increase exports.

IRON AND STEEL TRADE

ORDER-BOOKS of many of the heavy engineering concerns, notably those manufacturing plant and equipment, reflect a rising trend in capital expenditure, particularly within the iron and steel industry itself. Contracts provide for the completion of plant and new units up to 1962. Growing pressure for structural steel, beams, joists, and sections arises largely from home needs connected with the erection of new factories and plant over a wide field of industry, but exports continue to play an important part in the general economy of the iron and steel industry.

Pig-iron

Record imports of foreign ores are being discharged to meet the needs of the blast furnaces, which are providing equally outstanding outputs of pig-iron. The supply of all grades is now sufficient to meet the present demand, both for consumption and stocking.

Overall outputs of the low-phosphorus irons, which are specified more freely than other grades, are sufficient for the requirements of the engineering and speciality foundries. Good quantities of hematite and some refined irons are also being taken up. Availability of high phosphorus pig-iron is greater than the current requirements of the light, jobbing, textile, and some engineering foundries, but stocks at the furnaces are kept to manageable proportions by the call from oversea buyers.

Ferro-alloys

Ferro-tungsten is unchanged in price and is receiving steady attention. There is a good demand for ferro-molybdenum, while ferro-vanadium is fairly active. Ferro-silicon is reasonably well supported and the call on ferro-chrome is at a good level. There is a moderate demand for ferro-manganese and calcium silicide.

Steady support is given to ferro-titanium, and ferro-niobium remains active. Interest in chromium metal is steady.

Semi-finished Steel

As far as the availability of skilled labour will allow—and it is still below requirements—the re-rollers maintain good outputs. The majority have full order-books for all their products and there is a consistent demand for small bars, light sections, and reinforcing rods.

Most of the re-rollers are well provided with steel semis in the lower carbon ranges, but a shortage in the higher carbons and special grades of steel is reported from a number of areas.

Finished Steel

Most producers have sufficient work on hand for joists, sections, plates, small sections, and bars to keep them busy until the new year. Some mills are more congested than others with a sizeable backlog of orders. The plate mills are also heavily committed, particularly for the thinner gauges, and present promise for delivery is Period 1, 1961.

Because of the congested position at the steelworks the stock holders are doing a considerably better trade. Demand for cold-reduced sheet is maintained at a substantial level, but the pressure is now not so great as it was some months ago when consumers turned in desperation to US and continental sources for supplies.

There is a good demand at present for galvanized flat and corrugated sheets for the home and export markets and the makers of hot-rolled sheets, especially ¼ in., have sufficient tonnages on their books to keep them busy for the next few months.

Policy for Industrial Growth Urged by TUC

UNLESS the Government was prepared to make industrial growth a definite object of its policy, all the exhortations to increase production and productivity was so much "whistling in the dark." This was the view of Mr. L. T. Wright, chairman of the TUC production sub-committee, who introduced a section of the report dealing with production and industrial development at the Trades Union Congress at Douglas, IOM, last week.

Mr. Lewis said that unless the rate of industrial growth proceeded faster, all the resolutions which congress had passed would be much harder to attain. The Government had a way of dealing with industrial matters which was largely out of date. A target should be set for British industrial production, and all other Government policies geared to it, he asserted. The Common Market countries had done this and were looking forward to an annual rate of growth of 5 per cent. There was a case, he suggested, for a Minister of Industrial Development, who would co-ordinate industrial growth.

Mr. S. W. G. Ford, president of the National Union of Mineworkers, introduced a composite motion on the distribution of industry, stating that congress was seriously concerned at the lack of employment opportunities in Scotland, Wales, North of England, and Northern Ireland, which showed unemployment figures far above the national average. It called on the Government to be more effective in providing employment, to direct industry to these areas, and to develop a more positive employment programme. The difficulties in the coal industry of the last year or so, he said, could have been avoided had the Government adopted a properly co-ordinated fuel policy. The Government had to face up to the problem with far more vigour and imagination. It was not enough to wait until there was a high level of unemployment and then treat it with palliatives.

Mr. J. Jarvie (Associated Blacksmiths, Forge and Smithy Workers' Society) said the distribution of industry could not be left to the choice of private enterprise. As anxious as the movement was to have new industry in areas of high unemployment, it was not prepared to attract them by offering cut price trade union rates.

ABOUT 600 MEN at Manvers Main coke-oven plant, South Yorkshire, who went out on strike over a pay claim on Monday of last week, resumed work on Wednesday pending negotiations with the NCB.

Coalfield News

Tribute to Pioneers in Miners' Rehabilitation

WORK of two Lanarkshire pioneers in the field of miners' rehabilitation was commemorated at Uddingston, near Glasgow, on Thursday of last week when a plaque was unveiled by Mr. J. McKendrick, county secretary of the National Union of Mineworkers. The plaque bore the names of Mr. Alex. Miller, orthopaedic surgeon at Uddingston Rehabilitation Centre from 1945 until his death last year, and Dr. George McFeat, who did much to have the centre instituted. He died this year.

Tributes to the work of both men were paid by Mr. H. Atkinson, secretary of the Coal Industry Social Welfare Organization; Mr. W. Smith, deputy chairman of the Scottish Divisional Coal Board; Dr. A. McDougall, present orthopaedic surgeon at Uddingston, and Mr. McKendrick. Many miners undergoing treatment at the centre were present.

LONG SERVICE awards and cheques to mark their retirement were presented last Saturday to 26 miners of Coegnant Colliery, Maesteg (Glam). Most of the men had 50 years' service in the pits.

FOLLOWING their recent retirements from Waunlwyd Colliery (Mon), Mr. A. Samuel, undermanager, Mr. M. Sprake, training officer, and Mr. T. White, deputy, received presentations from their colleagues at the colliery.

IN SPITE of objection by 15 local miners who receive concessionary coal from their collieries which they will not be able to burn, the Minister of Housing and Local Government this week approved a plan for Chesterfield's first smokeless fuel zone.

BECAUSE of "events which have recently taken place at Dungavel residential training centre for young miners," at Strathaven (Lanarkshire), the principal is to be given the authority to suspend any trainee on a serious charge of breach of discipline.

SAFETY WEEK at Huncoat Colliery, Accrington (Lancs) was opened on Monday by Mr. R. M. Forster, HM District Inspector of Mines. Miners competed in finding built-in "faults" in a mock coal face, and other events included fire fighting and first aid.

THE SEAMEN'S STRIKE, the Durham Divisional Coal Board states, caused another 100,000 tons of coal to be stockpiled last week. The total awaiting shipment from pitheads in the county is 300,000 tons. Last weekend seven loaded colliers and one ore carrier were still held up.

AUTOMATIC milk vending machine has been installed for use of miners at the pit face at Nantgarw Colliery, Taff Vale (Glam). Made by Joseph Sankey & Sons, Limited, Wellington (Salop), it has a capacity of 210 half-pint cartons of milk, maintained at 38-43 deg. F by a ¼-h.p. refrigeration unit.

LONG-SERVICE certificates were presented recently to four miners who retired from Kinglassie Colliery (Fife), after more than 50 years' service each in the mining industry. The awards were presented by Mr. J. Kennedy, colliery manager, to Mr. W. Johnstone, Mr. Peter Horsburgh, Mr. G. Eadie, and Mr. Frank Clark.

DEPUTY at Hickleton Colliery for more than 20 years, Mr. F. W. Robinson, has been nominated for the post of Agent of the Yorkshire Area of the National Association of Colliery Overmen, Deputies, and Shotfirers. Election takes place this month. The post, representing 8,000 colliery officials, was recently vacated by Mr. L. Wormald on his election as Yorkshire Area general secretary. Mr. Robinson is secretary of the Hickleton branch of the association, and a member of the Area executive committee. He serves on the committee of the South Yorkshire Mining Society, and recently won a second-class mine manager's certificate.

ALBERT WELSH, underground worker at Horden Colliery (Co. Durham) and 1959 darts champion of England and Wales, is featured in the October Mining Review, the National Coal Board's monthly newsreel. Other items include the story of the deed that brought James Gillan the George Medal and the Kent coalfields gala day in Dover.

CHESTERFIELD colliery trainee, 16-year-old George Doherty, who was too short to join the police as a cadet, intends to enrol about 30 boys and girls between the ages of 14 and 16 "to give the police a helping hand." He explained: "I think it is time youngsters got down to the matter of helping the police. There is too much crime and too many road accidents." His recruits would be stationed anywhere where they could help people.

RETURN to work was made on Tuesday by 1,200 miners at Dodworth Colliery, Barnsley, who went on strike on Wednesday last week over working conditions. NUM officials inspected the face where the trouble started. The men passed a resolution calling for the removal from the pit of the undermanager, Mr. Frank Fairclough, who they claim allowed the men to work in unsafe conditions and had not made sufficient roof supports available.

DEPUTATION FROM the Caerphilly Urban Council (Glam) housing committee is to meet local officials of the National Coal Board to discuss an alleged campaign to turn ex-miners out of houses owned by the board in the Caerphilly district. The committee was told that eviction orders had already been made, and if these were successful many more would follow. It was suggested that the Coal Board was trying to get houses empty to attract people into the industry.

Coroner Warns on "Danger Spot" After Pit Death

CORONER at a Barnsley inquest on Monday on Mr. J. Winrow, 29-year-old miner who died after being trapped by a fall of stone at Dodworth Colliery (Yorks), said: "There was a great crack in the roof and a space of 7 yds. by 2 ft. which was unsupported. It was a most dangerous spot. No doubt the Mines Inspector and the management will take this in hand. It does seem dangerous for men to go in these areas where there are large sections of roof unsupported." The jury returned a verdict of Misadventure.

Mr. Robert Peacock, deputy in charge of the district, said there was a break in the face for 25 yds. where Mr. Winrow was working. He told him to get some extra roof supports. Later he heard what he thought was a fall of stone and found Mr. Winrow partly buried. He thought Mr. Winrow was trying to get a prop set when the fall occurred.

Mr. Andrew Betton. NUM branch secretary at Dodworth, said there had been a fall on the face the previous week, and added: "I hope we get some quicker attention in putting in supports after such falls."

A spokesman for the Coal Board at Dodworth said later that there would be no inquiry into the accident.

THE COAL TRADE

DEMAND, artificially boosted in August (in spite of the weather) by predictions of a winter shortage owing to probable manpower and transport difficulties, has shown no signs of abating and most merchants are snowed under with orders. It is unusual in the first half of September to have to report delivery delays for ordinary household qualities but that is what is happening in the majority of districts. Add to the situation the approaching end of summer prices and the increases announced yesterday (Thursday) and merchants may be forgiven if they venture a wish for a little breathing space to sort out their affairs.

SCOTLAND

Glasgow.—For the next few weeks production in the division will be affected by the statutory one-day autumn holiday, which, as with the summer vacation, is staggered according to locality. In addition the general standard of output continues to show a drop of some 30,000 tons a week on last year's performance as a result of the planned curtailment of production.

This has been particularly helpful in slowing down the increase in unsold stock, which is now only slightly higher than a year ago at 1,232,000 tons, against 1,138,000 tons. Having regard to a fall in tonnages held in reserve at consumers' premises the aggregate of distributed and undistributed stocks is almost on a par with 1959.

Retail sales of house coal fluctuate widely with changes in the weather, but trade generally is much more satisfactory than last year. Supplies are plentiful except in the best coals in the top groups. An indication of the change in the seasons is provided by more activity in briquettes, but the volume of business as yet is well below the peak. Pre-packed doubles in 28 lb. bags prove very popular, and the method of sale through retail newsagents and general merchants is functioning satisfactorily.

Gas coke and hard coke nuts and most manufactured fuels move slowly. Anthracite nuts keep very busy, and large is clearing more readily than it was, while all low volatile duffs have an adequate market between inland and export demand. Industrial supplies are on the whole comfortably balanced against users' needs. Throughputs of coking coal for the steel industry are high, but orders are being delivered promptly.

Singles are meeting a brisk demand, and pearls are selling more freely. Good supplies of doubles are available, but demand is strengthening. There is a good turnover in washed and untreated smalls, and duff presents no serious problem to the marketing authorities. Metallurgical coke is extremely busy, but supplies are good.

Fife and Lothians.—Production in both zones is running very smoothly and supplies are comfortable, with the exception of the best coals in group 2, demand for which keeps very strong.

WEST MIDLANDS

Collieries are lifting stocked coal in an effort to meet their contractual commitments, but shortages of particular colliery descriptions are not infrequent. However, where these occur, substitute tonnages of a somewhat comparable quality and size are being offered. Best selected coals are a very strong feature, though there is considerable pressure for all large coal and cobbles. House nuts, which are fairly plentiful, are not too popular with the public and many customers are disposed to wait until the right size and quality can be supplied. A very good demand is being experienced in respect of the well-known open fire premium fuels. Stocks of house coal at merchants' depots are being run-down, but every effort is being made to accumulate winter stocks.

The pressure for supplies of solid fuel is also being felt in respect of all types of domestic boiler fuel. Supplies of anthracite are not nearly sufficient to meet the flow of orders. Best stove nuts and beans are the biggest problem, but dry steam nuts are also difficult, while "Phurnacite" and other special fuels are tighter than they were. Orders for coke are now more numerous, but supplies of domestic sized gas coke are plentiful.

The demand for industrial coal is not excessive as most buyers know that the supply position is adequate. Manufacturers are taking supplies in accordance with contract schedules and their stocks are being gradually built up. Now and again short delays arise in the completion of orders for singles and doubles, but other descriptions are freely delivered. Supplies for the public services are up to commitments and stocks of ample dimensions are in hand.

The market for hard coke has picked up all round. The best feature is blast-furnace coke and in spite of a fairly big increase in consumption most buyers appear satisfied. Engineering qualities are in better request, but supplies are more than adequate. Hard coke nuts are dull, though with the near approach of the space-heating season, orders are plentiful. Business in foundry coke is running at a record level, but supplies are not too difficult, though buyers are not always able to secure the brand they prefer.

Record Issue Year for British Standards Institution

RECORD year was achieved by the British Standards Institution in 1959-60 with the issue of 297 new or revised standards. Sales of publications were also at the record level of nearly 1,100,000, about one quarter of which went oversea, and the number of subscribing members reached a peak figure of over 11,000. The annual report to March states that the institution's range of activities is becoming more extensive which suggests that in the coming year or two the output of standards will be at least as high as the year under review.

The report adds that as the institution's burden becomes heavier, an accelerated rise in subscriptions and income generally will be necessary if the BSI is to carry out its basic work with proper efficiency and if it is to extend the related services of promoting the application of standards, helping in education, and providing publicity, especially oversea.

Board Changes

New Directors for MI Group Members

MR. D. L. FREEMAN has been made a director of COX & DANKS, LIMITED, scrap metal processors, steel stockists, etc., of London, N.W.10, and will be responsible for the London branch of the company, which is a member of the Metal Industries, Limited, group. Mr. Freeman, who joined Cox & Danks in 1934, was previously a manager in the London branch.

Mr. B. W. G. Gurney has been appointed managing director of FARMER BROS. (SHIFNAL), LIMITED, structural engineers, of Shifnal (Salop), a member of the group. Mr. Gurney was previously works director of another MI company, John Allan & Company (Glenpark), Limited, non-ferrous metals, of Glasgow.

WALTER SOMERS, LIMITED—Mr. J. Mitchell has joined the board.

MIDLAND INDUSTRIES, LIMITED—Mr. W. Barnes has joined the board.

CONCRETE DEVELOPMENT COMPANY, LIMITED—Mr. A. Marcham has been appointed director and general manager.

F. PERKINS, LIMITED—Mr. A. J. Scamp has been appointed to the board from which Mr. G. E. Smith has resigned.

ANDERSONS RUBBER COMPANY, LIMITED—Mr. W. M. Meacham has been appointed a director. He will continue as secretary.

EASTWOODS, LIMITED—Sir Derek Walker-Smith, Conservative MP for Hertford, East, has been co-opted to the board. He resigned as Minister of Health in July.

H. & R. WATERFALL & BARBER, LIMITED—Mr. George Pepper, sales manager, Joseph Gillott and Sons, Limited, steel manufacturers, of Sheffield, has been appointed a director.

METAL CLOSURES, LIMITED—Miss J. R. Sherriffs has resigned as a director of the company and of its subsidiaries, Plastic Closures, Limited, and Johnson Brothers (Closures), Limited.

COLVILLE CONSTRUCTIONAL COMPANY, LIMITED—Mr. J. A. Kilby, Mr. A. Reid, and Mr. D. J. Graham have been appointed to the board of the company which is a subsidiary of Colvilles, Limited.

ACOUSTICAL INVESTIGATION & RESEARCH ORGANIZATION, LIMITED—Dr. Richard V. Waterhouse has been appointed managing director of the company, which is a member of the Hall-Thermotank, Limited, group.

GEO. W. KING, LIMITED—Mr. A. L. Hood has been appointed a director. He is on the boards of J. Henry Schroder & Company, Limited, Associated Electrical Industries, Limited, and George Wimpey & Company, Limited.

US INDUSTRIES INC. (GREAT BRITAIN), LIMITED—Mr. John Boardman has been appointed deputy chairman. He is also deputy chairman of Burtonwood Engineering Company, Limited, the manufacturing facility of USI, which was acquired last October.

D. NAPIER & SON, LIMITED—Mr. H. E. C. de Chassiron has been elected to the board and is to succeed Mr. H. Sammons as managing director on January 1, 1961. Mr. de Chassiron joined the parent company, English Electric Company, Limited, in 1958 and is at present assistant to the general manager of the Rugby works. Mr. Sammons joined D. Napier & Son in 1942.

Machine-tool Industry Research Plan

NEW research association is being formed to serve the British machine-tool industry. Sponsored by the Machine Tool Trades Association, it will administer funds contributed by the industry for research projects in machine-tool design and production. About 100 manufacturers of machine tools and in allied industries have undertaken to finance the association for a minimum of five years, and it is also intended to apply for aid to the Industrial Grants Committee of the Department of Scientific and Industrial Research.

An announcement this week by the Machine Tool Trades Association says that the new association will not involve the construction of new laboratories to act as a centre of development and design, which has sometimes been canvassed for the industry, but will simply co-ordinate and expand the work of machine tools which is being carried on at existing establishments, such as the Manchester College of Science and Technology.

By this means, it is stated, quicker results from a wider range of research projects will become available to the industry than would be the case if the Machine Tool Industry Research Association waited for the erection of its own laboratories. A director of research "of the highest possible qualifications" will be appointed in the near future, and the association will let out work by contract to existing research establishments.

John Brown Acquires Bone Bros.

ALL the shares of Bone Bros., Limited, makers of paper making and converting machinery and plastic extrusion machines, of Wembley (Middx), have been acquired by John Brown & Company, Limited, shipbuilders, marine engineers, etc., of Glasgow. The business of Bone Bros. will be complementary to a portion of Brown's wholly-owned subsidiary, Cravens, Limited, Sheffield, in whose engineering division a range of plastic injection moulding machines is manufactured together with die-casting machines and metal-working presses.

Mr. Noel Browne will continue as managing director of Bone and the following will be elected to the board: Mr. E. Mensforth, Mr. J. E. Owston, Mr. G. K. Johnston, Mr. D. Grant and Mr. H. C. Cook.

Law Report

ONLY ACCIDENT IN A CENTURY

FIRM of Henry Ellard & Sons, Limited, makers of domestic appliance fittings, of Willenhall (Staffs), was fined £50 at Willenhall Magistrates' Court for failing to fence securely a power press. A factory inspector said the tool and die were unfenced. A broken clutch spring caused the press to repeat, and the operator lost part of a thumb.

For the company, which pleaded Guilty, Mr. R. King said it was the first serious accident which had happened in the works since the firm was founded 100 years ago.

NEW ADDRESS of Craven Electronics, Limited (formerly of Bradford), is Victoria Works, Bingley, Yorks (telephone: Bingley 2362/3).

COMPANY NEWS

COLTNESS IRON COMPANY, LIMITED—An interim of 4d. per 6s. 8d. share in respect of the year to September 30, 1960, is to be paid. A single payment of 9d. per share was made for 1958-59.

BROMILOW & EDWARDS, LIMITED, engineers, of Bolton—Interim dividend is being increased by 1 per cent. to 7 per cent. in respect of the year to November 30, 1960. The 1958-59 total was 15 per cent.

ARMSTRONG SHOCK ABSORBERS, LIMITED—Dividend is being raised from the equivalent of 17½ per cent. to 25 per cent. for the year to June 30, 1960. Group net profit increased from £278,074 to £364,764, after taxation of £33,887 (£282,342).

EASTWOODS, LIMITED, manufacturers of cement, bricks, tiles, etc., of London, E.C.1—Group net profit for the year ended March 31, 1960, rose from £286,990 to £501,336, after tax of £499,378 (£344,605), and a final dividend of 12½ (10) per cent., as forecast, makes 17½ (15) per cent.

THOMAS BLACKBURN & SONS, LIMITED, constructional engineers and ironfounders, of Preston—The directors state that the company's progress justifies payment on September 30 of a dividend for 18 months from April 1, 1959, to September 30, 1960, on the 6 per cent. cumulative preference shares.

REICHOLD CHEMICALS, LIMITED—Interim dividend in respect of 1960 is maintained at 7½ per cent. on capital increased by a one-for-eight scrip issue and a subsequent one-for-four rights issue. Dividends totalling not less than the previous 22½ per cent. were forecast for this year when the rights issue was made.

JAMES H. LAMONT & COMPANY, LIMITED, engineers and brassfounders, of Edinburgh—An interim dividend of 4½ per cent. is announced in respect of 1960, which compares with the equivalent of 3½ per cent. for 1959. A total equal to 20 per cent. on the present capital, as increased by a 50 per cent. scrip issue, was paid last year.

JOHN THOMPSON, LIMITED, makers of boilers and ancillary equipment, nuclear power plant fabrications, etc., of Wolverhampton—The interim is reduced from 7½ per cent. to 5 per cent. in respect of 1960. A final of 12½ per cent. made a total of 20 (25) per cent. for 1959. Group net profit for 1959 dropped from £501,055 to £324,311.

COMBINED ELECTRICAL MANUFACTURERS, LIMITED—The offers for the capitals of Hackbridge & Hewittic Electric Company, Limited and Switchgear & Cowans, Limited, has been accepted by holders of more than 90 per cent. of Hackbridge and by more than 86 per cent. of Switchgear. The offer is now unconditional, but further acceptance will be entertained.

A.P.V.-PARAMOUNT, LIMITED, manufacturers of ferrous and non-ferrous castings, of Crawley (Sussex)—Licence has been obtained from the Sivyer Steel Casting Company, of Milwaukee, USA, to manufacture and sell certain products in Europe and the British Commonwealth. The equipment consists of refinery fittings, and will be sold under the name "Sivyer."

TIMKEN ROLLER BEARING COMPANY, LIMITED—Sales and earnings this year will not match the records set last year, states Mr. W. R. Timken, president. For 1959 the company reported record sales of $262,093,455, while earnings set a new peak at $29,856,040. The sharp drop in steel operations this year, plus a decline in the industrial bearing line business had more than offset a marked increase in railroad bearing orders and the continued good volume of automotive business and foreign operations.

ALUMINIUM CORPORATION, LIMITED—Trading profits amounted to £296,139 in the year ended July 31, 1960, compared with £142,793 for the previous seven months. The dividend is 22½ per cent. against a distribution of 15 per cent. for the previous period, which included a jubilee bonus of 5 per cent. After all charges, the net profit is £143,928, against £55,337.

SOUTH WITBANK COLLIERIES, LIMITED—Pointing out that shareholders who accept the offer of Tavistock & Uitspan Collieries, Limited, would receive the total equivalent of 9s. on the Uitspan shares, the directors state that this compares with between 10s. and 12s. 6d. on their present holdings. Profits of the current year to date would justify a dividend of between 2s. and 2s. 6d. per 10s. share.

ALEXANDER STEPHEN & SONS, LIMITED, shipbuilders and repairers, etc., of Govan, Glasgow—Dividend is restored with a 10 per cent. payment for the year ended March 31, 1960. Another 2½ per cent. capital distribution is to be paid, making 5 per cent., tax free. Net profit was £329,639, after tax of £152,537 (£7,088), compared with a loss of £34,733 previously which resulted from a trade union dispute.

W. H. ALLEN, SONS & COMPANY, LIMITED, electrical, mechanical, and hydraulic engineers, of Bedford—The offer to purchase the capital of William Foster & Company, Limited, will close on October 4 or not later than October 25. If the offer becomes unconditional it is intended that the board of William Foster shall remain unchanged and that the remuneration of the directors be increased by a total of £5,000 a year as from March 1, 1960.

A.P.V. COMPANY, LIMITED, makers of process plant and equipment, etc., of Crawley (Sussex)—The directors propose to make a free scrip issue of one-for-five involving capitalizing £250,000 from reserves. The board also foreshadows maintaining on the increased capital the 8½ per cent. dividend. This would mean an effective increase to 10.2 per cent. on the present basis. Trading for the first half of the current year is better than for the corresponding period last year.

TIPPER INDUSTRIES, LIMITED, ironfounders, of Birmingham—An interim dividend of 5 per cent. on the £1,200,000 ordinary 5s. shares is to be paid. Last year an interim of 7½ per cent. was paid, but since then the ordinary capital has been doubled by a free scrip issue of one-for-one. The effective comparison with the present payment is thus 3½ per cent. The board warns, however, that the increase does not necessarily indicate a higher total dividend.

SANGAMO WESTON, LIMITED, manufacturers of electric meters and apparatus, of Enfield (Middx)—Trading profit increased to £268,200 for the first six months of 1960, from £232,822 for the corresponding period last year. After deducting £68,668 for depreciation, etc., the balance is £199,532 (£164,885). The stock and work in progress was not physically examined at June 30, 1960, and to this extent the figure of profit at that date must be regarded as approximate, the directors state.

CLARKSON (ENGINEERS), LIMITED—Turnover of the company for the first nine months of the current year to November 30, 1960, shows a marked increase. Maintenance of this level of activity will result in

record turnover and profits being achieved, the directors state. As forecast, the interim dividend is held at 7½ per cent. on capital increased by a one-for-four scrip issue, an effective rise of 1½ per cent. A maintained final of 12½ per cent. (equivalent 10 per cent.) has also been foreshadowed.

CHARLES ROBERTS & COMPANY, LIMITED, carriage and wagon builders, and financiers, near Wakefield (Yorks)—The company is not paying a further dividend on the ordinary capital for the year ended March 31, 1960, but recommends the distribution of £69,908, forming part of the realized accretions to capital now standing to credit of capital reserve, at the rate of 3d. for each 5s. ordinary unit. A maintained interim of 7½ per cent., less tax, has already been paid in respect of 1959-60. The 1958-59 total dividend was 15 per cent.

ADA (HALIFAX), LIMITED, machine tools and domestic electric appliance manufacturers, of Halifax (Yorks)—In connection with the bid from Philips Electrical Industries, Limited, Mr. W. D. Gibbs, chairman, states that the Ada accounts for the four months to July 31 last, show a trading profit of only £4,878, which is likely to be more than absorbed by the expected loss for August. He adds that it is unlikely that an early solution of the difficulties will be found, and the directors cannot hold out any hope of an interim dividend. As announced, acceptance is recommended by the board.

COPE ALLMAN & COMPANY, LIMITED, non-ferrous tube manufacturers, of Birmingham—Final dividend of 12½ per cent. maintains 25 per cent., as forecast, for the year to March 31, 1960, on the capital increased by a 40 per cent. scrip issue, representing an effective rise of about 7.1 per cent. in the payment. Group net profit for the year rose to £118,487 (£70,927) after tax of £102,107 (£68,280). In view of the continued expansion of the business a rights issue of 350,000 "A" ordinary 5s. shares at 16s. 3d. per share is to be offered to ordinary and "A" ordinary holders on a one-for-three basis. The directors forecast a total dividend of not less than 25 per cent. for 1960-61 on the increased capital.

BTC Has Not Ignored Water Carriage of Coal

REPLY to the criticism by Mr. Robert Aickman, founder and vice-president of Inland Waterways Association, Limited, in the Daily Telegraph, that inland waterways were unmentioned by the British Transport Commission in its plans to supplement by road transport the winter carriage of coal, has been made by Mr. J. H. Brebner, BTC public relations officer.

Mr. Brebner gives an assurance that inland waterways have not been overlooked, but points out that the difficulties which may be encountered in rail transport during the winter are expected to occur mainly in short-haul traffic. If the destinations for coal are not water-connected, as they are not today in many places where these difficulties might arise, the waterways obviously cannot be of much assistance, he points out.

Mr. Brebner adds that inland waterways play an important part in the carriage of coal and so far this year have carried over 2,250,000 tons—an increase of about 6 per cent., compared with 1959. Regular contact is maintained by the National Coal Board and its divisions and British waterways.

Coal Stocks Position

DETAILS of coal stocks as at September 3, 1960, compared with those available at September 5, 1959, are given in the appended table issued by the Ministry of Power.

Figures in parentheses, mainly calculated on the basis of requirements during the winter, indicate the total weeks which the tonnage in stock would last.

Week ended:—	Sept. 3, 1960.	Sept. 5, 1959.
	Thous. tons.	Thous. tons.
Distributed stocks—		
Public-utility undertakings—		
Gas	1,771	2,452
	(3.5)	(4.6)
Electricity	5,992	6,895
	(5.1)	(6.1)
Railways	490	511
	(2.7)	(2.4)
Coke ovens	1,153	1,039
	(2.1)	(2.1)
Industrial consumers—		
Iron and steel	190	190
	(2.2)	(2.2)
Engineering and other metal industries	261	322
	(3.0)	(3.7)
Other industries	1,689	1,860
	(3.2)	(3.5)
TOTAL INDUSTRIES	2,140	2,372
Merchants' stocks—		
(*a*) House coal	1,247	1,563
	(1.7)	(2.1)
(*b*) Anthracite and boiler fuel	188	190
	(3.1)	(3.2)
Miscellaneous (estimated)	335	381
TOTAL DISTRIBUTED STOCKS	13,316	15,403
Undistributed stocks—		
At collieries (on ground and in wagons)	28,134	25,439
At open-cast sites	6,552	6,793
TOTAL UNDISTRIBUTED STOCKS	34,686	32,232

Thomas Marshall Widens Management Scope

CHANGES in management are announced by Thomas Marshall & Company (Loxley), Limited, fireclay refractory manufacturers, of Sheffield. To provide the managing director, Mr. Arthur Marshall, with some relief from the increasing responsibilities which the continual growth of the company creates two assistant managing directors have been appointed. Mr. W. T. Hale becomes assistant managing director on sales and commercial matters and Mr. T. A. Marshall becomes assistant managing director generally responsible for production and works' control.

Mr. Hale joined Carblox, Limited, a subsidiary of the Marshall group, in 1948, was appointed sales manager of the parent company three years later and sales director in 1954. Mr. Marshall has been with the company 10 years and for some time was works manager at Marshalls' Storrs Bridge Works.

TECHNICAL STATE SCHOLARSHIP has been awarded to Miss Gloria Jones (20), an engineering apprentice at Carmarthen Bay Power Station. She is to study for a technical diploma at the Advanced Technical College of Cardiff, rather than take a university degree to which the scholarship entitles her.

NEWS IN BRIEF

ANOTHER 30,000-ton iron ore cargo from Venezuela is due at the ore quay, Tyne Dock, on October 7. This will be the fourth cargo of this size to be handled at the installation within a year.

STEEL PRODUCTION in the US this week is estimated by the American Iron and Steel Institute at 1,503,000 tons, compared with 1,401,000 tons (revised) last week and 356,000 tons in the corresponding week of last year.

IN THE FIRST seven months of the year 1,365,017 tons of coal were shipped from Sunderland, all but 208,280 tons to British coastal ports. The total was nearly 76,000 tons up on the corresponding period of 1959.

AT ITS MEETING on Tuesday, Barnsley Town Council passed outline plans for a steel rolling mill at Grange Lane. The mill is to be built by C. G. Carlisle & Company, Limited, stainless steel manufacturers, of Sheffield.

TWO-YEAR search for metallic ores in Iraq has been started by Soviet experts who recently arrived in the country. The Russians will also look for sulphur, phosphates, and other minerals in various regions of the country.

THE FIRM of W. Stanley Jones (Engineering Supplies), Limited, 21, Market Street, Altrincham (Ches) (telephone: ALTrincham 4957), has been changed to Mining Improvements, Limited. The address and telephone number remain the same.

BY AGREEMENT with the Star Engineering Company, Limited, Worcester, Lloyd-Metcalfe Designs, Limited, mechanical engineers, of Emscote (Warwickshire), is to take over the distribution, sales, and service of Starloc safety gas cocks and fittings, and to take a larger share in their manufacture.

PRIVATE INQUIRY into the cause of the underground explosion in which four men died in July at Cardowan Colliery, Stepps (Lanarkshire), opened on Monday at the Cardowan Colliery office. The inquiry, ordered by the Minister of Power, was conducted by H.M. Deputy Chief Inspector of Mines, Mr. H. R. Houston.

APPOINTED BY J. I. Case Company, Limited, to be sole Case distributors for Wales and Monmouthshire, Wm. Lewis (Agricultural House), Limited, Cardiff, will be responsible for sales, service, and maintenance of Case wheeled and crawler industrial tractors throughout the area and for holding stock of machines and parts.

COAL AND COKE shipments through the port of Garston, Liverpool, during August totalled 64,163 tons, of which coal shipments accounted for 63,163 tons. Shipments to the various destinations were: Northern Ireland, coal 50,715 tons, coke 820 tons. Eire, coal 9,105 tons. Isle of Man, coal 3,343 tons, coke 22 tons. Foreign, coke 1,668 tons.

PLANS AND ESTIMATES for a £9,000,000 nitrogen plant to be built by African Explosives & Chemical Industries (Rhodesia), Limited, at Salisbury, Southern Rhodesia, have been completed. Mr. K. W. Spilhaus, the managing director, said the plant, which will produce nitrogen for both explosives and fertilizers, should be in full production by about 1965.

STUDY, MANUFACTURE, AND SALE of industrial refrigerating equipment throughout France and the Common Market countries is to be undertaken by a new company—Le Froid Industriel Brisoneau York, SA—formed by Brissoneau et Lotz, the French engineers, and the American Borg Warner Group. The new company has a capital of NF 750,000.

GEORGE KENT, LIMITED, Luton (Beds), in collaboration with Ingeniorsfirman Stig Wahlstrom, AB, its Swedish representatives, is taking part in the commercial section of the 5th International Instruments and Measurements Exhibition in Stockholm this week, with a display of industrial measuring and automatic-control equipment. The exhibition closes tomorrow (Saturday).

A POOLS WIN almost stopped production at the Sprotborough (Doncaster) works of John Fowler & Company (Leeds), Limited, makers of diesel crawler tractors, diesel locomotives, etc., on Tuesday. Nine men engaged on important export orders learned that their syndicate had won £11,311. They took 10 minutes off to congratulate one another and then went back to work.

FOLLOWING AN APPEAL by the mother of an electrical engineering apprentice, the National Insurance Commissioner has decided that a 17-year-old apprentice can count for family allowances if his net weekly earnings are less than £4 9s. 6d. For apprentices age 16 the limit is £4 7s. and for those aged 15 £4 4s. 6d. It is estimated that some 30,000 families will benefit from the revision.

NEW COMPANY under the name of Alan Cobham Engineering, Limited, with an initial capital of £100 in £1 shares, has been formed by Flight Refuelling (Holdings), Limited. Stated objects of the company are "to carry on the business of manufacturers of and dealers in equipment and appliances for the handling, movement, containment, and control of fluids and gases of all kinds."

EXPERTS ATTACHED to the Austrian organization, Verein für Einkaufsberatung, have developed at the country's Simmering gasworks a process for rendering coke dust free and water repellent. So cheap is this process said to be that it need result in no price increase in the treated coke. The Viennese gasworks has decided to treat all coke destined for general sale by the method.

PRACTICAL course in human relations called "Direction and supervision of scientific and engineering personnel," will be held at Northampton College of Advanced Technology, London, from October 12. It will consist of 16 full days at fortnightly intervals, during which senior administrators and technologists will study an imaginary organization represented by specially written case studies.

NORTHERN REGION of the Federation of British Industries is to hold a "round table" export conference in Durham City on October 14. Chief object is to bring firms which do little or no exporting into contact with active exporters, together with export-import merchants, bankers and other specialists. Mr. E. G. Fairburn, chairman of the federation's Northern Regional Council, will preside.

PUBLICATION of the newspaper Press Exchange is to be continued by the Pressed Steel Company, Limited. The newspaper, issued for the first time last June, is part of a new series of company publications designed to keep employees informed of trends and developments within the organization. Later this year a full-colour illustrated magazine, Picture Press, will be issued for external and internal readership.

NUMBER of companies taking part in the Engineering Group Apprenticeship Scheme has more than doubled

in the past three years. At the end of July, 1957, there were 10 groups with a membership of 139 firms, while at the end of July this year there were 20 groups with a membership of 329 firms and just under 500 boys in training. The new intake this year is forecast to bring the total of apprentices in training to about 650.

PARTY of 35 directors of companies in the Detroit branch of the American Society of Tool and Manufacturing Engineers is to visit this country at the beginning of October as the guests of the Gauge and Tool Makers' Association. During the trip the Americans will visit automobile, aircraft, and general engineering firms and will be entertained at luncheons given by the association and the Dollar Exports Council.

Loss by United Gas in Reorganization Year

GROUP net loss of £167,672, after exceptional losses of £243,428 (nil), is reported by United Gas Industries, Limited, for the year to March 31, 1960. This figure is against a net profit of £54,095 for the previous year. The ordinary dividend is 2½ per cent. against a total of 6 per cent. The trading profit was £246,602 against £279,146. The exceptional losses were almost entirely in respect of losses arising on tools, stocks, and fixed assets which became obsolete or redundant following changes in production policies, or as a consequence of reorganization of certain subsidiary companies.

All the major companies are trading this year at least as successfully as in 1959-60, and the chairman, Mr. H. H. Bates, looks forward to a group trading profit roughly similar to that for 1959-60. Reorganization of the company's activities should be almost completed by the end of the year, providing a firm base of control for the future.

The directors are working towards the creation of three basic divisions: meters; engineering and appliance; and furnace and construction. The meters division is still the mainstay of the business and retains its position in a highly competitive market, the chairman adds.

West Canadian Collieries' Board Replies to Criticisms

DIRECTORS of West Canadian Collieries, Limited, have replied to criticisms of the board's policy and proposals for the distribution of the company's quoted investments and proceeds of a debenture redemption.

Mr. E. H. Bernard, chairman, states that it is the board's policy to fulfil its principal object—to carry on kinds of exploration and mining business and particularly to ensure that the large part of resources represented by coal mines will not be lost to shareholders. It is desirable, in the directors' opinion, to take a reasonably long view and not to sacrifice the assets by any forced sale.

The distribution proposal could only be effected by a sale of the investments and distribution of cash. At present market conditions any such sale would be at poor prices and contrary to members' best interests. Furthermore, if the company were to distribute the proceeds of a sale it would be left without the liquid assets which will be required if its mineral resources are to be made fully productive.

Coal Chartering

THERE has been a little more activity from the American coal market, although the main interest is on Japanese account with rates about steady but tending to improve. Tonnage of about 13,000 tons was secured from the Roads to Japan for September 2/25 at $8.35, which rate was repeated for similar size for September 3/15 and 12,000 tons for September/October fixed at $8.50. Hampton Roads/Chiba took 12,000 tons for September 26/October 20 at $8.40.

Some small interest has been noted on South American account. Hampton Roads/Buenos Aires took 9,500 tons at $5.75 with the option of 3,000 tons of steel at $8.25 for November 1/30, and to Brazil, 16,000 tons to Rio de Janeiro at $5.25 for October/November with gross discharge. Handy 7,500 tonner has been closed from the Roads/Cork at $4.35 for September with free discharge. Some interest is noted for Italian destinations. Durban/Rangoon reports 9,000 tons at 44s. f.i.o. for October 10/31 and from Newcastle, N.S.W. 10,000-tonner has been arranged for Osaka at 37s. 6d. f.i.o.t. for November 5/30.

There is some small interest from the UK ports to the Mediterranean area but very little business has been reported, although a 1,950-tonner has been taken from Swansea/Pireaus at 55s. for middle September. There are inquiries coastwise, with a quiet interest to France, and East Coast UK quotes rather freely to Scandinavia.

Hawker Group Expansion in Nuclear Power Field

NUCLEAR ENGINEERING, LIMITED, formerly a subsidiary of G. A. Harvey & Company (London), Limited, has been acquired by Hawker Siddeley Nuclear Power Company, Limited, a member of the Hawker Siddeley Group, Limited. Nuclear Engineering has been engaged in the manufacture of equipment for handling and using radio isotopes, but under its new management it will concentrate on irradiation equipment, for which a number of orders have already been received from universities and research organizations at home and oversea.

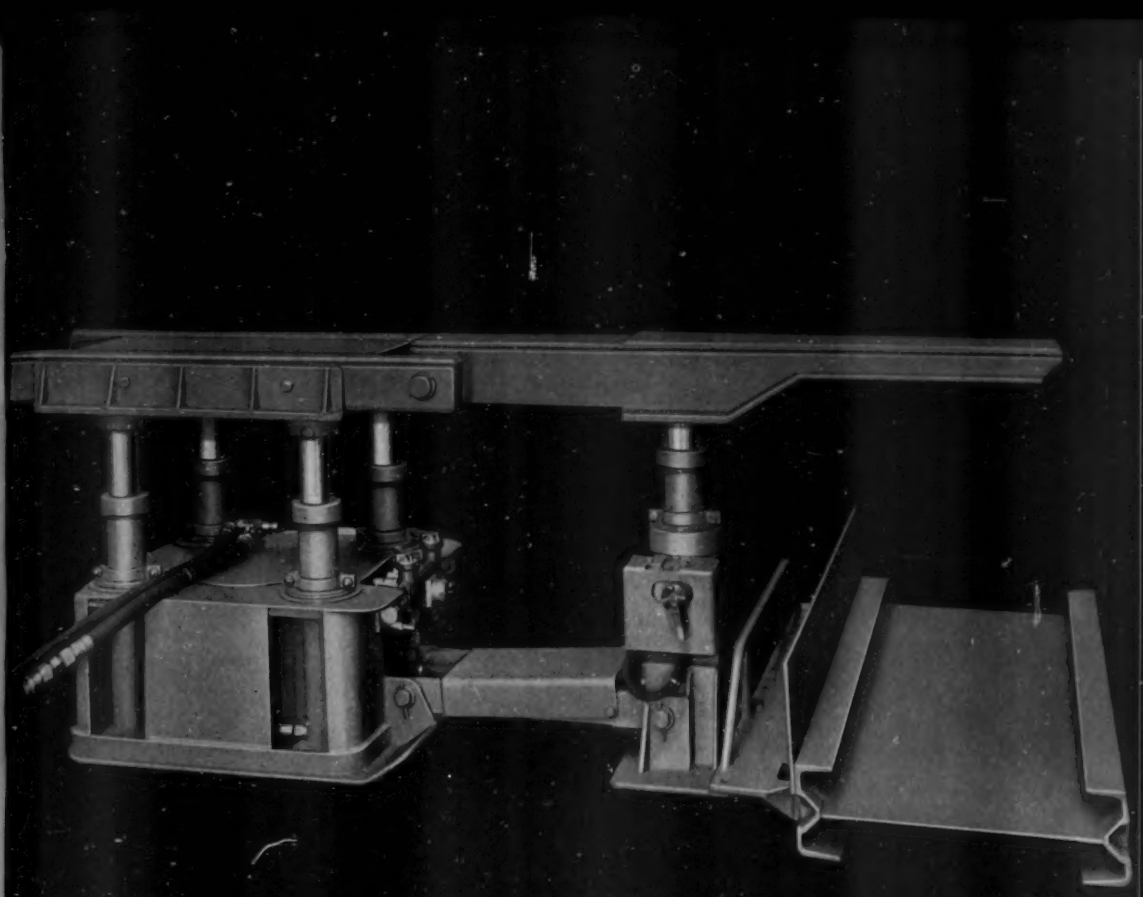
The company's activities in the field of industrial radiography have been taken over by Pantatron, Limited, London, W.1.

The Hawker Siddeley Group, Limited, this week announced two further acquisitions and the formation of a new subsidiary. The Kenton Engineering Company, Limited, general engineers, of Rothley (Leics), and Nuclear Engineering, Limited, have become subsidiaries, and Hawker Siddeley Brush (Central Africa) (Private), Limited, has been formed and registered in Central Africa.

Alcan Industries, Limited

NAME of the Northern Aluminium Company, Limited, has been changed to Alcan Industries, Limited. The new name involves no change of ownership, manufacturing activity, or sales policy, its purpose being to identify the company more clearly as a member of the Aluminium, Limited, of Canada group, as "Alcan." It is proposed to retain the trade name "Noral."

Other operating and trading companies in Aluminium, Limited, are currently changing names for the same reasons.



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Coal Stocks Coming into Line

UNDISTRIBUTED stocks of coal are gradually coming into line with the situation 12 months ago, the difference having narrowed to less than 3,000,000 tons, compared with nearly 8,000,000 tons three months ago. In addition merchants are steadily building up stocks nearer to the 1959 level.

Production fell off slightly last week owing to the incidence of holidays in the North-Eastern Division of the NCB, but here again the general trend is gradually coming into line with 1959 output, the lower figures for 1960 being accounted for almost entirely by reduced open-cast output.

There were 590,900 wage-earners on colliery books on September 3, against 650,400 on September 5, 1959, the numbers engaged at the coal face being 224,800 and 252,800 respectively. Total absenteeism (all workers) in the week ended September 3 was 15.09 per cent. compared with 14.69 per cent. in the week ended September 5, 1959. Output at the face was 3.908 tons and overall 1.371 in the week ended September 3, compared with 3.657 and 1.317 tons in the week ended September 5.

The following table gives (in tons) the output of saleable mined coal by division in the week ended September 10, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended September 10, 1960.		Week ended September 12, 1959.
	Total output.	Tonnage lost.	Total output.
Scottish	354,400	3,700	377,800
Northern (N&C) ..	241,600	100	261,300
Durham	468,800	—	460,600
North-Eastern ..	562,900	255,000	592,800
North-Western ..	236,700	18,000	258,100
East Midlands ..	778,800	85,200	768,000
West Midlands ..	268,300	200	297,800
South-Western ..	367,800	9,400	398,100
South-Eastern ..	26,200	200	32,400
Great Britain—			
Deep-mined coal..	3,305,500	371,800	3,446,900
Other deep-mined (including licensed mines) ..	41,500	—	56,000
Open-cast coal ..	121,900	—	217,200
TOTAL	3,468,900	371,800	3,720,100

Olympic Star Welcomed Home

FIRST official engagement of Olympic silver and bronze medallist, Miss Dorothy Hyman, on her return from Rome, was a reception in her honour at Hobart House, headquarters of the National Coal Board. Her home is in the Yorkshire mining village of Cudworth, near Barnsley, and she did much of her training at the neighbouring mining village of Hickleton where she is a member of the local athletic club.

Miss Hyman was taken straight from the station to Hobart House where, with her parents, she met Sir James Bowman, chairman, and other members and officials of the NCB, Mr. H. J. Atkinson, general manager of the North Barnsley Area of the North-Eastern Divisional Coal Board, and Mrs. Atkinson, and Mr. H. Atkinson, chief officer and secretary of the Coal Industry Social Welfare Organization.

ECSC Coal Output Raised 5 Per Cent. in August

COAL production during August in the countries of the European Coal and Steel Community reached a total of 18,650,000 metric tons, according to figures published last week by the High Authority. This was 318,000 tons more than July, but 1,000.000 tons less than in May—the difference being largely due to the holiday period. Production was nevertheless 5 per cent. higher than in August last year, this being due entirely to a higher level of production in the Ruhr, where an improvement in the market eliminated the need for short-time working.

In the first eight months of this year Community production as a whole was 0.3 per cent. higher than in 1959, but while production was higher both in West Germany and the Netherlands it fell by 2.1 per cent. in France. In Belgium the level of production remains static, the over-production of mines due to be closed cancelling out the progress made with the programme of closures.

Detailed figures of output in August, with the production figures for January to August, 1960, in parentheses, are: West Germany, 11,732,000 (94,665,000) tons; Belgium, 1,815,000 (14,826,000) tons: France 4,035,000 (37,058,000) tons; Italy, 60,000 (496,000) tons; Netherlands, 1,013,000 (8,120,000) tons.

Production quotas for Belgian coal are proposed by the High Authority in a new effort to meet the continuing crisis of the coal industry in that country. Announcing this in Luxembourg after its weekly meeting, the Authority said that its proposals had been submitted to the Comunity's Council of Ministers, which is next to meet on October 10. Last Friday the Belgian coal situation was discussed at a meeting between representatives of the High Authority and the Belgian Government. Three subjects were discussed—the proposal to limit production, the future of subsidies to the Belgian mines, and the scheme for special aid to miners affected by short-time working.

The High Authority had previously discussed with Belgian producers, trade unionists, and users the proposal to fix production quotas. The producers had indicated that they would be willing to agree to this on condition that coal imports into Belgium continued to be restricted, and once a decision had to be taken on which mines are to be closed. The trade union representatives also indicated their agreement on condition that the available work was equitably distributed among the miners at work. The coal users, who also admitted the need for quotas of production, underlined the need, for technical reasons, to maintain a sufficient supply of coking coal from third countries.

"HELMETS FOR ALL MINERS" DRIVE AFTER PIT DEATH

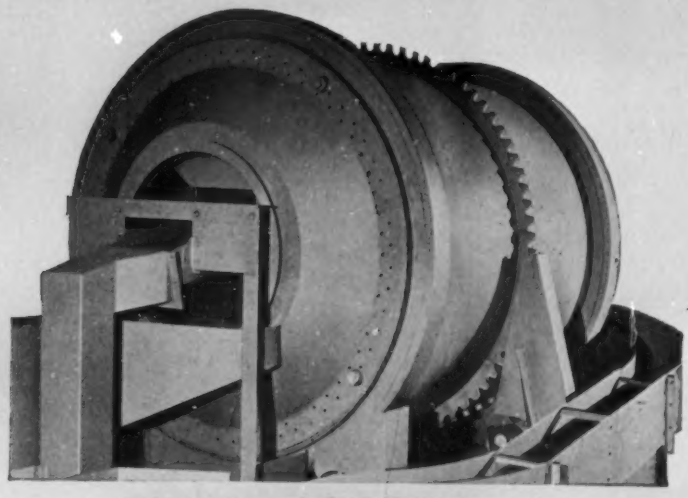
AN all-out campaign to have every miner wear a safety helmet was promised by Mr. George Hayes, manager of Hatfield Main Colliery, near Doncaster, at an inquest on Tuesday on Mr. Frederick Anderson, a 16-year-old haulage hand. A pathologist had given evidence that had the youth worn a safety helmet when he went to uncouple two tubs near the pit bottom, his life might have been saved.

It was stated that Mr. Anderson's head was trapped between the tubs. A verdict of Accidental Death was returned.

clean coal

middlings

refuse



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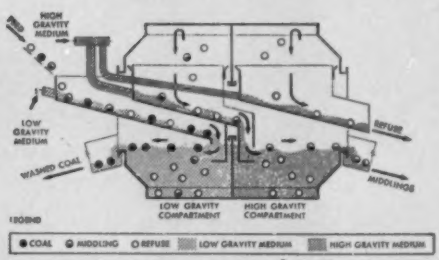

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Electrical Department for Scots Technical College

ELECTRICAL industry in the UK now provides employment for more than 1,000,000 people, and last year the value of manufactured electrical products exceeded £1,400,000, said Sir Willis Jackson, president of the Institute of Electrical Engineers, when he opened a new £300,000 electrical engineering department at Robert Gordon's Technical College, Aberdeen, on Monday.

He said he was pleased at the extent to which the Government had come to recognize that expansion of facilities for technical education at all levels was needed as a matter of great national urgency. He feared that the present lack of facilities at professional, technical, and craft levels might well prove to be the Achilles heel of our effort to achieve continuing industrial progress. More of the smaller and more specialized industrial concerns, he thought, should follow the example of group training set up by the electrical industry in Scotland, in collaboration with the two electricity boards.

The new department provides extra laboratories, notably for radiation and acoustics, and for increased space in all the present research departments.

Lancashire Foundry Trade

REASONABLY steady trading conditions have been reported this week in the pig-iron section of the Lancashire iron and steel markets, and with the holiday season now at an end producers are hopeful of a reasonably satisfactory flow of business during the remaining months of the year. It is understood the users are making moderate additions to their stocks of pig-iron, but for the most part they are content to do little more than cover early needs as the current supply position is relatively comfortable.

The majority of engineering foundries in the district seem to be well placed for work over the next few months and are calling for regular supplies of iron, while a fair tonnage is being taken up in other sections. Derbyshire No. 3 is on offer for delivery in the Lancashire area at £21 1s. 3d., Staffordshire low-phosphorus iron at £23, and West Coast hematite at £25 16s.

In the market for semi-finished steels an improved demand for forging materials continues to be reported, and there has been no apparent decline in the requirements of the wire mills.

Discussions on the New Wages Act

PAYMENT of wages by cheque and the 1960 Payment of Wages Act will be discussed at a meeting at the British Institute of Management, 80, Fetter Lane, London, on Monday. Leading the discussion will be a senior official of the Ministry of Labour, Mr. H. J. Witheridge, Midland Bank, a representative of the Ford Motor Company, Limited, Mr. Harry P. Cemach, a management consultant, and Mr. T. P. S. Woods, industrial relations department, Imperial Chemical Industries, Limited.

Wage payment systems and how they will be affected by the new Act will also be the subject of a talk by Mr. Harry Samuels, barrister-at-law, at a meeting at the Industrial Welfare Society, 48, Bryanston Square, London, W.1, on September 26.

Increases of Capital

BRITISH ORE INVESTMENT CORPORATION, LIMITED, increased by £4,999,900, in £1 shares, beyond the registered capital of £100.

ASHTON YOUNG ENGINEERING DEVELOPMENT COMPANY, LIMITED, increased by £7,500, in £1 shares, beyond the registered capital of £5,000.

NORTH DOCK ENGINEERING COMPANY, LIMITED, increased by £22,000, in £1 ordinary shares, beyond the registered capital of £3,000.

TRUFORM GAUGE COMPANY, LIMITED, Walsall, increased by £18,000 in £1 ordinary shares, beyond the registered capital of £2,000.

STEEL RADIATORS, LIMITED, Southall (Middx), increased by £70,000, in £1 ordinary shares, beyond the registered capital of £50,000.

BARKING ZINC OXIDE, LIMITED, London, E.C.4, increased by £60,000, in £1 ordinary shares, beyond the registered capital of £40,000.

METAL CONSTRUCTIONS, LIMITED, Worcester, increased by £10,000, in £1 ordinary shares, beyond the registered capital of £50,000.

TAP & DIE CORPORATION, LIMITED, London, W.1, increased by £1,500,000, in 5s. ordinary shares, beyond the registered capital of £1,500,000.

ROTARY HOES, LIMITED, West Horndon (Essex), increased by £50,000, in 5s. ordinary shares, beyond the registered capital of £1,250,000.

J. W. COLPITTS & COMPANY, LIMITED, engineers, etc., of Blyth, increased by £34,000, in £1 shares, beyond the registered capital of £1,000.

BORO SERVICE, LIMITED, boilermakers and cleaners, of London, W.C.2, increased by £29,000, in £1 shares, beyond the registered capital of £1,000.

BLATTER ENGINEERING COMPANY, LIMITED, London, N.9, increased by £14,000, in £1 shares, beyond the registered capital of £1,000.

T. R. CREFFIELD & SON, LIMITED, engineers, etc., of London, W.11, increased by £15,000, in £1 shares, beyond the registered capital of £20,000.

SOVEX, LIMITED, engineers, etc., of Erith (Kent), increased by £125,000, in £1 ordinary shares, beyond the registered capital of £75,000.

LORRAINE ENGINEERING COMPANY, LIMITED, London, S.W.7, increased by £5,900, in £1 ordinary shares, beyond the registered capital of £100.

LANCELEYS, LIMITED, founders, engineers, etc., of Chester, increased by £1,000, in £1 ordinary shares, beyond the registered capital of £2,500.

FARNWORTH DIE CASTING COMPANY, LIMITED, Blackburn, increased by £9,000, in £1 ordinary shares, beyond the registered capital of £1,000.

BURGESS & COMPANY (ENGINEERS), LIMITED, Bracknell (Berks), increased by £44,000, in £1 ordinary shares, beyond the registered capital of £6,000.

HAMILTON PERRYN (ENGINEERS), LIMITED, Stanmore (Middx), increased by £4,900, in £1 ordinary shares, beyond the registered capital of £1,000.

WM. PARK & COMPANY FORGEMASTERS, LIMITED, Wigan, increased by £650,000, in 2s. ordinary shares, beyond the registered capital of £350,000.

JAMES BOOTH ALUMINIUM, LIMITED, Birmingham 7, increased by £5,000,000, in £1 "B" ordinary shares, beyond the registered capital of £5,000,000.

MARTIN HOIST & ENGINEERING COMPANY, LIMITED, London, W.1, increased by £6,900, in £1 ordinary shares, beyond the registered capital of £100.

WALTER KORNER, LIMITED, engineers, etc., of London, W.1, increased by £4,500, in £1 ordinary shares, beyond the registered capital of £500.

THOMPSON & ENGINEERING COMPANY, LIMITED, Daventry, increased by £2,000, in 2s. 6d. ordinary shares, beyond the registered capital of £1,000.

Non-ferrous Metal Prices

(Delivered, unless otherwise stated)

Copper—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 250s. 0d. per cwt. basis; 20 s.w.g., 285s. 0d. per cwt.

Brass—Solid-drawn tubes, 1s. 10½d.; sheets up to 10 w.g., 206s. 0d. per cwt.; wire, 2s. 8½d.; rolled metal, 206s. 0d. per cwt.

Lead Sheets, etc.—Sheets, £109; pipes, £111 5s. per ton.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, ex works English destinations, £124; rolled zinc (boiler plates), ex works, all English destinations, £121 15s.; zinc oxide (Red Seal), d/d buyers' premises, £100 per ton.

Other Metals—Nickel, £600. Aluminium ingots, £186. Antimony, English, 99 per cent., £200. Quicksilver, ex warehouse £69 10s. to £70. Bismuth (per lb.), 16s. nom. (1-ton lots). Cadmium, 10s. 6d. per lb. Magnesium ingots (per lb.), 2s. 2½d. to 2s. 3d., notched bars 2s. 9½d., powder 6s. 1d. Platinum, per oz. (troy), £30 5s.